3.0 ALTERNATIVES

As required by NEPA and FERC policy, we evaluated alternatives to the Projects. These include the No Action Alternative, energy alternatives, system alternatives, route alternatives, and site alternatives. In assessing and evaluating alternatives, it is important to recognize that not all conceivable alternatives are technically and economically practical and feasible. Some alternatives may be impracticable because the sites are unavailable and/or the alternatives are incapable of being implemented after taking into consideration costs, existing technologies, constraints of existing system capacities, and logistics in light of the overall objectives of the Projects. In conducting an analysis of reasonability, it is also important to consider the environmental advantages and disadvantages of the proposed action and to focus the analysis on those alternatives that may reduce impacts and/or offer a significant environmental advantage.

In evaluating alternatives, we used the following criteria:

- would the alternative offer a significant environmental advantage over the Projects;
- does the alternative have the ability to meet the objectives and schedule of the Projects; and
- is the alternative technically and economically feasible and practicable?

In consideration of the second evaluation criterion, Transco's objectives for the Projects are to:

- provide firm delivery lateral service of 647 Mdth/d of natural gas to National Grid's distribution system in Queens County, New York through the Rockaway Project;
- provide as part of the 647 Mdth/d, 100 Mdth/d of new incremental (i.e., additional) natural gas supply to National Grid through the Northeast Connector Project; and
- enhance the security and reliability of National Grid's distribution system by providing a new delivery point on the Rockaway Peninsula in Queens County that would allow National Grid to shift existing volumes of natural gas supply from an existing delivery point in Long Beach in Nassau County.

While the in-service date was not considered an objective to the Projects in defining a purpose and need, it was considered in the evaluation of alternatives. This is because some alternatives would be unable to meet the objectives of the Projects within a reasonable timeframe, if at all. For example, some potential alternatives would require many years to plan, permit, and construct.

Our identification of alternatives to the proposed Projects took into account public comments and input received from the NPS and other federal, state, and local regulatory agencies. The analysis of alternatives is based on information provided by Transco and our review of aerial photographs, U.S. Geological Survey (USGS) topographic maps, other publicly available information, input from the NPS and other cooperating agencies, and our site visits.

Through the application of evaluation criteria and subsequent environmental comparisons, each alternative was considered until it was clear that the alternative was not reasonable or would result in greater environmental impacts that could not be readily mitigated. Those alternatives that appeared to be

the most reasonable with less than or similar levels of environmental impact are reviewed in the greatest detail below.

3.1 NO ACTION ALTERNATIVE

Under the No-Action Alternative, the potential environmental impacts associated with the Projects would not occur, but the objectives of the Projects would not be met. As noted above, the Projects would provide 647 Mdth/d of natural gas to National Grid at a new delivery point on the Rockaway Peninsula in Queens County. This would give National Grid the ability to redirect all or some of its system capacity, currently contracted to their existing Long Beach delivery point, to the new delivery point in Queens during peak demand periods. As part of the 647 Mdth/d, the Projects would provide 100,000 Mdth/d of new natural gas to the existing National Grid natural gas distribution system in New York. The addition of the new delivery point and the increase in incremental supply would help meet the growing energy demands of National Grid's customers in the Rockaways and Brooklyn, and enhance the reliability and security of National Grid's existing distribution system, especially during periods of peak demand.

In response to the No Action Alternative, Transco or other natural gas companies could develop another project or projects to provide the proposed natural gas supplies and services to National Grid. Such alternative projects could require the construction of additional and/or new pipeline facilities in the same or other locations. These projects would result in their own set of specific environmental impacts that could be equal to or greater than those described for the Projects.

It is possible that National Grid's existing and potential new customers would seek to use alternative fossil fuel energy sources (such as fuel oil or coal), other long-term fuel source alternatives (such as nuclear power or hydropower), and/or renewable energy sources (such as wind or solar power) to compensate for the reduced availability and reliability of natural gas resulting from the No Action Alternative. As is the case with other natural gas pipelines, each of these alternative energy source projects would have environmental impacts. It is also possible that energy conservation practices could be used to offset demand for natural gas in the markets that would be supplied by the Projects. Section 3.2 discusses each of these energy alternatives, including increased efficiency, conservation, renewable energy sources, and use of other non-renewable fuels.

We received a comment from the NPS that increasing the availability of natural gas could stimulate construction of more homes and businesses, which in turn could result in growth inducing impacts such as increased population density, water pollution, and traffic. While none of these potential impacts would result from the No Action Alternative, they could result from any of the other alternatives, which, like the Projects, would increase the energy supply in Brooklyn and Queens. We also note that a small portion (about 15 percent by volume) of the natural gas to be provided to National Grid by the Projects is incremental (i.e., additional). The majority (about 85 percent by volume) is replacement gas, which currently is provided to National Grid via the existing delivery point in Long Beach. Additionally, it is anticipated that at least a portion of the incremental new supply of natural gas provided by the Projects would be used to convert existing heating systems from oil to natural gas, and thus would not likely contribute to new growth and development or its related impacts.

For all the reasons stated above, we do not believe that the No Action Alternative would be a practicable or preferable to the Projects.

3.2 ENERGY ALTERNATIVES

3.2.1 Energy Conservation and Increased Efficiency

Energy conservation measures have and will continue to play an important role in reducing energy demand in the United States. The Energy Policy Act of 2005 (EPAct) included guidelines to diversify America's energy supply, reduce dependence on foreign sources of energy, increase residential and business energy efficiency and conservation (e.g., the EPA's ENERGY STAR®, Program), improve vehicular energy efficiency, and modernize domestic energy infrastructure (U.S. Congress, 2005).

In 2007, Congress passed the Energy Independence and Security Act (EISA) to increase the efficiency of products, buildings, and vehicles, protect consumers, and improve federal energy performance by setting up new incentive programs and expanding certain programs created under EPAct. According to the U.S. Department of Energy (DOE), the key highlights of the EISA include improved corporate fuel efficiency, a renewable fuels standard, and new energy efficiency standards for lighting and other appliances, including lamps, dishwashers, dehumidifiers, and clothes washers (Congressional Research Service, 2007).

Two additional bills were passed between October 2008 and February 2009 in response to the economic downturn in the United States: the Energy Improvement and Extension Act (EIEA) and the American Recovery and Reinvestment Act of 2009 (ARRA). The EIEA included provisions to extend tax credits for energy-efficient residential properties and appliances (including installations of geothermal heat pumps), bicycle commuting, and renewable and alternative fuels usage, to limit consumption and increase efficiency. The ARRA provided more than $16 billion for the DOE's Office of Energy Efficiency and Renewable Energy (EERE) for the Weatherization Assistance Program, Energy Efficiency and Conservation Block Grants, Energy Efficient Appliance Rebate Program and ENERGY STAR®, and various alternative fuel programs for both transportation and energy production.

While all four of these acts have key goals of reducing energy consumption nationally, thus increasing energy efficiency, the impacts on the target region are unclear. The availability and use of these recently enacted federal energy efficiency programs and subsequent energy consumption reductions has yet to be analyzed in much of the United States.

Several state-led initiatives have contributed to energy conservation. New York, for example, has promoted energy conservation and has a number of programs in place to minimize energy use. While data from the New York Independent System Operator (NYISO) demonstrate that statewide energy use dropped a total of 5.1 percent in 2008 and 2009 (primarily due to the downturn in the economy), it also indicates energy use grew by 3 percent in 2010. Energy use in the New York City area in 2010 also exceeded 2008 levels (NYISO, 2011a).

EPAct and the other federal, state, and municipal programs promote increased energy efficiency and conservation by supporting new energy efficient technologies and increasing funds for energy efficiency research. While these initiatives may minimize energy use, they are not expected to eliminate the increasing demand for energy or natural gas. Additionally, the implementation and success of energy conservation in curtailing energy use is a long-term goal that would involve large-scale public education efforts, significant incentives, and government intervention extending well beyond the timeframe of the proposed Projects. Therefore, while energy conservation and energy efficiency would reduce the demand for fossil fuels to some degree, it would not eliminate the need for additional natural gas supply in the market area served by the Projects.

3.2.2 Renewable Energy

Renewable energy sources are another long-term fuel source alternative to natural gas, including hydropower and other renewable energy sources (e.g., wind, biomass, solar, tidal, and geothermal energy). The DOE/U.S. Energy Information Administration (EIA) (2013a) projects rapid growth in renewable fuel consumption due primarily to the implementation of the federal renewable fuels standard for transportation fuels and state renewable portfolio standard (RPS) programs for electric generation. Nationally, the consumption of renewable energy is projected to increase between 2011 and 2040 from 6.8 quadrillion Btus per year to 10.3 quadrillion Btus per year (DOE/EIA, 2013b).

Renewable energy sources are slowly becoming feasible alternatives due to improving technologies and government policies to make them viable sources of energy for New York State. Assuming full implementation of the "15 by 15" policy, the state energy plan indicates that approximately 40 percent of New York State's energy needs for all sectors (e.g., electricity generation, transportation, commercial, industrial, agricultural, and residential) could be met by renewables by 2018, 60 percent of which would come from solar and wind resources (New York State Energy Planning Board, 2009). Considering electrical energy use, the current supply of renewable electricity in New York State accounts for approximately 17 percent of total electricity demand, but this could potentially increase to more than 75 percent of total demand by 2018 under the "15 by 15" policy (New York State Energy Planning Board, 2009).

While each of the renewable energy sources discussed below has associated environmental impacts, these are more clearly defined for technologies currently in use (e.g., wind turbines may affect birds and bats). The impacts of newer technologies have yet to be determined (e.g., the potential impacts of hydrokinetic energy).

Wind

Wind power is a proven technology that has experienced significant advancements in recent years including reduced installation costs, improved turbine performance, and reduced maintenance costs. Although wind projects have no emissions, such developments can affect wildlife, such as birds, as well as other environmental resources. In the vicinity of the Projects, the windiest sites tend to be located along shorelines that are challenging to access, densely populated, and highly valued for other uses.

To date, most of the large-scale renewable projects participating in the New York RPS program are wind projects located in northern and western New York where wind resources are greatest. Current wind generation capacity in New York is about 1,350 megawatts (MW) or less than 1 percent of statewide generating capacity (American Wind Energy Association, 2011; NYISO, 2011a). Interconnect requests into NYISO's queue as of February 2011 would add another 7,000 MW of wind capacity (NYISO, 2011a). Since the wind farm areas are typically located far from major downstate load areas, significant infrastructure improvements would be necessary for these projects to serve the New York City area. To address this, proposals are being evaluated to develop wind resources closer to or in the vicinity of major load areas.

The New York Power Authority (NYPA), Long Island Power Authority (LIPA), and Consolidated Edison (Con Edison), in collaboration with other public agencies, conducted technical and environmental studies to determine the feasibility of siting a wind farm about 13 to 17 miles offshore of the western end of the Rockaway Peninsula to generate 350 MW of electricity (with the potential to expand to 700 MW in later phases) to serve the New York City and Long Island market. In June 2010, the NYPA Board of Trustees authorized the NYPA to apply for a lease for approximately 64,500 acres of underwater land from the Bureau of Ocean Energy Management (BOEM). In September 2011, the NYPA submitted a request to the BOEM to lease approximately 81,500 acres or 127 square miles

offshore of the Rockaway Peninsula for construction of up to 700 MW of wind power. The BOEM published a "Public Notice of an Unsolicited Request for a Commercial Outer Continental Shelf Wind Lease, Request for Interest, and Request for Public Comment" in the Federal Register on January 4, 2013 (BOEM, 2013a). Publication of the notice initiated a 60-day public comment period (BOEM, 2013).

In response to the public notice, the BOEM received expressions of interest from two companies, Fishermen's Energy, LLC and Energy Management, Inc., to develop commercial wind facilities in the same area as the NYPA proposal (BOEM, 2013b). The BOEM currently is reviewing these submissions to make a determination of competitive interest. If the BOEM determines there is competitive interest, it will use an auction to award lease(s) under a competitive lease process. If BOEM decides there is no competitive interest, it will publish its decision in the Federal Register. Then the BOEM may decide to proceed with the noncompetitive lease issuance process and if so, NYPA, LIPA, and Con Edison must submit any required plan(s) within 60 days of the aforementioned notice in the Federal Register (NYPA, 2013). In addition to the lease, a NEPA review would need to be completed before any project could be approved. The original proposal was to have the new offshore wind farm operational by 2015, but this may not be possible due to the analyses and approvals that still need to be completed.

Another wind project that is being evaluated is a five-turbine wind facility at the former Fresh Kills landfill on Staten Island (New York City Department of Parks and Recreation [NYCDPR], 2009). The feasibility of using the site for this purpose was studied by BQ Energy LLC in 2007, and New York City officials began soliciting bids from developers for the project in March 2012. The project, as currently envisioned, would generate about 20 MW hours (MWh) of energy. There is also a proposal by the U.S. Marines to erect wind turbines near the water on the southern end of Floyd Bennett Field (U.S. Marine Corps, 2013).

It appears likely that wind projects will continue to be pursued depending on tax credits and/or other financial incentives, state programs, technology improvements, transmission availability, and public interest. While wind energy may be able to replace the increased electrical generation capacity that could be provided by the additional natural gas supplied by the Projects, it would not replace the delivery efficiencies that the Projects would provide. Therefore, wind energy could not meet the objectives and schedule of the Projects, and it is also unlikely that the environmental impacts associated with construction and operation of the wind energy projects would be significantly less than those of the Projects.

Hydroelectric

While hydroelectric generation is fully commercialized, the DOE/EIA (2013a) has projected that little new hydroelectric capacity will be developed through 2040. Nonetheless, several hydroelectric projects are proposed in New York State. One new project that is awaiting a license from the FERC is the Thompson Hydroelectric Project on the Hudson River in Greenwich, New York. This proposed project would consist of a dam, a generating unit with a capacity of 20 MW, a transmission line, and other facilities that, if licensed and constructed, would have an estimated annual generation of approximately 65 gigawatt (GW) hours (GWh).

The West Point Transmission Project is another recently announced project designed to bring electricity generated in upstate New York from a variety of sources into the New York City market. The proposed project by West Point Partners, L.L.C. would carry 1,000 MW (and be expandable to carry up to 2,000 MW) of electricity via a new electric transmission line from Athens, New York to an existing substation adjacent to the Indian Point Energy Center in Buchanan, New York about 38 miles north of New York City. The proposed 80-mile-long transmission line would include a 320 kV cable buried underneath the Hudson River and would use Voltage Source Conversion-High Voltage Direct Current (VSC-HVDC) technology. In addition to the transmission line, a VSC-HVDC converter station would be

constructed at each end of the line. According to the project sponsors, the transmission line is expected to provide broader access to renewable resources, including upstate wind and hydro power. The project sponsors have initiated environmental and routing studies to support their applications for an Article VII Certificate of Environmental Compatibility and Public Need from the New York State Public Service Commission (NYPSC) and Section 10 and Section 404 permits from the USACE. The applications for these permits were filed in 2013, and pending permit approvals, the sponsors hope to place the project in-service sometime in 2017 (West Point Transmission, 2012).

There is a proposed transmission project to import hydroelectric and wind power into New York State from Canada. The proposed project by Champlain Hudson Power Express, Inc. (CHPE) is to construct a 2,000-MW high voltage direct current transmission system from a converter station southeast of Montreal in Quebec, Canada to Yonkers, New York. The proposed transmission cables would be buried in Lake Champlain, the Hudson River, and under adjacent existing railroad rights-of-way. According to the project sponsors, the transmission line is expected to be used primarily by hydro and wind generators in Canada.

A projected energy market and emissions impact analysis, prepared by CHPE, states that the project would facilitate the import of more than 7,647,480 MWh of renewable energy per year, which would expand the renewable energy base within New York State by 13 percent. An application for a Certificate of Environmental Compatibility and Public Need Pursuant to Article VII of the New York Public Service Law was filed with the NYPSC in March 2010, and the project was approved by the NYPSC in April 2013. In June 2010, the DOE announced its intention to prepare an EIS to assess the environmental effects of granting a Presidential Permit (required to cross the U.S./Canadian border) for the project. An application for Section 404 and Section 10 permits for the project was filed with the USACE in December 2010. The review of the project by the DOE, USACE, and other agencies is ongoing. The draft EIS is expected to be completed in 2013. If the project is approved by all agencies, it could be constructed and be in-service as early as the end of 2017 (CHPE, 2012).

While hydroelectric energy may be able to replace the increased electrical generation capacity that could be provided by the additional natural gas supplied by the Projects, it would not replace the delivery efficiencies that the Projects would provide. Therefore, hydroelectric energy could not meet the objectives and schedule of the Projects, and it is also unlikely that the environmental impacts associated with construction and operation of hydroelectric projects would be significantly less than those of the Projects.

Biomass

Combustion of biomass is a proven technology using biomass feedstock, which, if properly grown, represents a renewable resource. In the State of New York, biomass (e.g., wood) has been the leading in-state renewable resource consumed in the residential, commercial, and industrial sectors as measured by primary energy input. According to the New York State Energy Plan, New York State annually uses 99 trillion Btus of wood and 13 trillion Btus of biogenic waste and has the technical and practical potential to develop 350 trillion and 14 trillion Btus annually by 2018, respectively (New York State Energy Planning Board, 2009). Current biomass generating capacity participating in New York State's RPS had a combined generation capacity of 81.5 MW as of December 31, 2010 (New York State Energy Research and Development Authority [NYSERDA], 2011). Since that time, one of the participating facilities has requested to suspend operations due to unfavorable economic conditions. That suspension of operations would reduce the total generation capacity by almost 4 MW. The mix of feedstock for these facilities includes wood, tire-derived fuel, coal, and landfill-derived methane (CH_4). Information from the NYISO indicates that biomass accounts for less than 2 percent of current generation capacity in the New York Control Area (NYISO, 2011b). Exactly how much generation capacity is

represented by biomass is difficult to determine as the NYISO data group CH_4, refuse, solar, and wood into one category.

The use of landfill and municipal waste biomass (i.e., CH_4) has been identified as a potential alternative energy source for the New York City area. Eight facilities currently use either landfill gas or municipal solid waste in the vicinity of New York City. Of these, three facilities (the Al Turi, Brookhaven, and Oceanside landfills), along with the Smithtown and Fresh Kills landfills, are enrolled in the EPA's Landfill Methane Outreach Program (LMOP) (EPA, 2009). For example, the Fresh Kills landfill in Staten Island, New York has been operating for almost 30 years, providing 1,800 million cubic feet (MMcf) of pipeline-quality gas annually, equivalent to 4.93 MMcf per day (MMcf/d) (National Grid, 2010). In addition, the EPA has identified two landfills (the Fountain Avenue Landfill and the Orange County Landfill) as candidates and ten other landfills as potential candidates for providing waste-generated energy and participating in the LMOP in the region (EPA, 2009). New York City has partnered with National Grid to develop the Newtown Creek Wastewater Treatment Plant as one of the nation's first "waste-gas-to-grid" projects. When completed, the project would inject enough purified digester gas into National Grid's distribution system to heat 2,500 homes in the Brooklyn, Queens, and Staten Island service area (New York City, 2011; National Grid, 2010). This is equivalent to approximately 317 MMcf per year, or 0.87 MMcf/d (National Grid, 2011). City officials hope to have a contract in place by 2013 (Navarron, 2012).

Currently, there is a lack of adequate infrastructure to transport biomass energy to market. Completion of the Projects would provide additional direct capacity to the National Grid system. Consequently, additional use of biomass-derived energy would require the construction of pipeline or other infrastructure, and these impacts would be similar to or greater than those of the Projects. Therefore, the use of biomass would not offer a significant environmental advantage over the Projects.

Solar/Photovoltaic

Solar or Photovoltaic power systems convert sunlight directly into electricity. A recent assessment of solar domestic hot water systems within New York State indicated that solar thermal energy could potentially provide over half of the energy required for water heating in a typical home that has adequate access to sunlight. Additionally according to the 2011 revision of PlaNYC, New York City's long-term planning document, solar energy has the greatest potential to generate electricity in the five boroughs of New York City (New York City, 2011). The NYPA is reviewing numerous proposals to generate solar power and, once proposals are selected, expects the installations to occur through 2014. The NYPSC has begun accepting proposals for solar pilot projects to start developing this resource in the New York City area. Con Edison filed such a proposal with the stated goal of generating 12 MW of electricity by 2011 (Smith, 2009). Subsequently, Con Edison reported that 8.5 MW of photovoltaic-generated energy was on its New York system in February 2011 (Con Edison, 2011), 5.6 MW of which was in New York City (Meister, 2011).

While these initiatives could potentially bring additional energy needed to supply the Brooklyn-Queens area, solar energy is least available during the winter months when demand for natural gas is highest and the scale at which customers would choose to install solar panels based on existing or future incentives is unclear. These systems generally are not well-suited for use as large-scale generation in the New York City metropolitan area due to relatively low direct insolation, lower efficiencies, and higher capital costs. The New York State Energy Planning Board (2009) cites the cost of solar systems as being among the highest for renewable technologies. Further, the inherent issues with constructing commercial-scale solar facilities in the area (e.g., developing technologies or constructing in highly developed residential areas) make it unlikely that sufficient solar power would be available to provide the levels of energy that are expected to be needed in the demand area within a timeframe reasonably close to the Projects.

While solar energy may be able to replace some of the increased electrical generation capacity made available by the additional natural gas supplied by the Projects, it would not replace the delivery efficiencies that the Projects would provide. Therefore, solar energy could not meet the objectives and schedule of the Projects.

Tidal and Wave

While New York State is committed to continued research and marketing the development of tidal, current, and other hydrokinetic resources in the New York City metropolitan area (New York State Energy Planning Board, 2009), wave and tidal energy technologies are still in the early stages of development. In January 2012, the Commission issued a pilot project license for the Roosevelt Island Tidal Energy Project, a 1,050 kilowatt (kW) pilot-scale hydrokinetic generation facility that would be located in the East River in New York City (FERC, 2011). The project would be constructed in three phases and operate for 10 years. When fully built out, the facility would generate about 2.4 GWh annually. Preliminary permits have been issued for three other pilot tidal projects in the East River—the Astoria Tidal Energy Project (Docket No. P-13730), the East River Tidal Energy Project (Docket No. P-12665), and the Wards Island Tidal Power Project (Docket No. P-12718). A preliminary permit also is pending for the Orient Point Tidal Energy Project in Long Island Sound (Docket No. P-14333). Of these, the Astoria Tidal Energy Project would generate a substantial amount of power, totaling an average of 3,600 MWh per day (MWh/d) of electricity. Still, this would be small compared to the proposed Projects, which by comparison could provide an incremental supply of 100 Mdth/d.

While hydrokinetic projects may be able to replace the increased electrical generation capacity made available by the additional natural gas supplied by the Projects, it would not replace the delivery efficiencies that the Projects would provide. Therefore, hydrokinetic energy could not meet the objectives and schedule of the Projects. Additionally, it is unlikely that the environmental impacts associated with construction and operation of hydrokinetic facilities would be significantly less than those of the Projects.

Summary of Renewable Energies

While the renewable energy projects that have been and will be proposed in New York State would help to diversify the electricity market and decrease the need for traditional fossil fuel energy sources, there still would be issues associated with the siting and development of renewable energy facilities. The cost to New York State of developing renewable projects is high. Time is another factor in the development of renewable energy infrastructure. Because many of the potential renewable energy projects in the region are in their initial planning phases, these projects would not address the shorter-term peak demand increases in the Brooklyn-Queens area. Additionally, some renewable technologies, such as tidal energy, have not been fully developed and currently have an unknown set of impacts, compared with typical natural gas pipeline projects. As such, renewable energies would not preclude the need for an additional natural gas delivery point or additional long-term supply to the Brooklyn-Queens area.

Another issue is that moving electricity from the point of generation to consumers may require significant investment in transmission as well as other additional infrastructure costs. Development of electric transmission lines associated with renewable projects would have potential impacts on air, water, ecological, and other resources similar to natural gas pipelines.

For all these reasons, we do not believe that renewable energies would be a practicable alternative to the proposed Projects, and we eliminated them from further consideration.

3.2.3 Nuclear Energy

Another traditional, non-renewable fuel source alternative to natural gas for electric generation is nuclear power. The EPAct incorporated a wide range of measures to support current nuclear plants and provided important incentives for building new plants, such that several companies are expected to submit applications for licenses to construct and operate new plants over the next several years (Nuclear Energy Institute, 2008). Nonetheless, while nuclear power is important regionally and currently accounts for approximately 14 to 15 percent of annual energy consumption in the Mid-Atlantic States, no increase in the use of nuclear power is expected between 2011 and 2040 based on projections by the EIA (2013a).

Currently, four nuclear power plants are operating in New York State. Combined these generate about 33 percent of the electricity generated in the state (EIA, 2012b). Over the last decade plans were announced for two new nuclear power plants – one by Public Service Electric and Gas Company (PSE&G) in New Jersey and one by UniStar Nuclear (Unistar) in New York State. The near-term prospects for these new power plants are unclear. Unistar's proposed project was suspended, at its request, in May 2010, and PSE&G has not identified the design or specific generation capacity of its proposed plant, which is not expected to be on-line until 2021.

Because the subject of nuclear power remains controversial, these proposals and any subsequent plans that arise to construct new or expand existing plants in the region would likely involve prolonged review. Furthermore, there are environmental and regulatory challenges concerning safety and security, the disposal of toxic materials (spent fuel), and alterations to hydrological/biological systems that would need to be addressed before any new plants could be constructed. Even if these challenges could be overcome, a new plant would not likely be operational for many years. For these reasons, nuclear power could not meet the schedule of the Projects, and it is also likely that the environmental impacts associated with construction and operation of nuclear power generating facilities would be greater than those of the Projects.

3.2.4 Fossil Fuels

Coal is no longer used as a direct source for home heating but could be used to provide additional electrical generation to meet the objectives of the Projects. There are 13 coal-fired plants operating in New York State, of which one, the Danskammer Generating Station in Orange County, is located in the downstate area. It is possible that additional output from this facility or development of a new generating plant could provide additional electricity during peak winter demand periods.

Additional use of oil by existing facilities, development of new oil-fired generating plants, or conversion of natural gas home heating systems to oil burning furnaces could provide additional electricity and heat during peak winter demand periods. An increase in the use of petroleum and oil-fired energy or heat sources would produce greater quantities of sulfur dioxide (SO_2), nitrogen oxides ($NO_{x)}$, greenhouse gases (GHGs), and airborne mercury than natural gas heating units and boilers (EPA, 1995). This would reduce regional air quality and would be in conflict with New York City's PlaNYC initiatives to increase natural gas distribution to improve reliability and encourage conversion from highly polluting fuels (New York City, 2011).

Increased reliance on other fossil fuels would result in secondary impacts associated with their production (such as oil drilling and coal mining); transportation via truck, rail cars, and/or pipelines; and crude oil refinement. In addition, unlike natural gas, coal use results in waste coal ash that requires disposal. For all these reasons, we believe that use of other fossil fuels would not offer a significant environmental advantage over the Projects.

3.3 SYSTEM ALTERNATIVES

System alternatives are alternatives to the proposed actions that would make use of existing, modified, or proposed natural gas pipeline systems to meet the objectives of the Projects. Implementation of a system alternative would make it unnecessary to construct all or part of the proposed Projects, although some modifications or additions to existing or proposed systems may be required to satisfy the objectives of the Projects. These modifications or additions would result in environmental impacts that may be less than, similar to, or greater than those associated with construction and operation of the Projects. The purpose of identifying and evaluating system alternatives is to determine whether the environmental impacts associated with construction and operation of the Projects could be avoided or reduced by using another pipeline system, while still meeting the objectives of the proposed Projects.

A viable system alternative to the Projects would have to provide a new delivery point in Kings or Queens Counties with a firm delivery capacity of 647 Mdth/d to increase the reliability of National Grid's distribution system into Brooklyn or Queens, including an additional 100 Mdth/d of incremental (i.e., additional) capacity. A viable system alternative would need to provide these services within a reasonably similar timeframe as the proposed Projects.

Our analysis of system alternatives includes an examination of existing and proposed natural gas systems that currently or eventually would serve the markets targeted by the Projects, and considers whether those systems would meet the Project's objectives while providing an environmental advantage over the Projects. The remainder of this section includes a discussion of existing or proposed natural gas pipeline systems that are near and/or extend into the market served by the Projects. Table 3.3-1 provides a summary of the other existing interstate natural gas pipelines (excluding Transco) that serve the New York City metropolitan area. Figure 3.3-1 depicts the location of these existing pipeline system alternatives in relation to the proposed Rockaway Delivery Lateral. A brief assessment of each of these systems is included below.

TABLE 3.3-1
Other Existing Interstate Pipeline Systems in the New York City Area

Pipeline	Average Operating Pressure (psig)	Pipeline Capacity in the Region as of 2011 (MMcf/d)	Average Flow in the Region as of 2007 (MMcf/d)	Facility (Pipeline or M&R) Closest to Proposed Onshore Tie-In	Minimum Additional Pipeline to Service the Brooklyn-Queens Area (miles)
Algonquin Gas Transmission	750	1,475	673	Roseland, NJ	32
Columbia Gas Transmission	650	95	29	East Hanover, NJ	32
Millennium Pipeline	N/A	525	N/A	Rockland, NY	41
Tennessee Gas Pipeline	800	377	322	River Vale, NJ	31
Iroquois Gas Transmission	1,440	520	396	Hunts Point, NY	16
Texas Eastern Transmission	1,102	700	244	Linden, NJ/ Staten Island, NY	16

Data Sources:
Capacity from EIA, 2012a.
Pressures and flows from EIA, 2009.

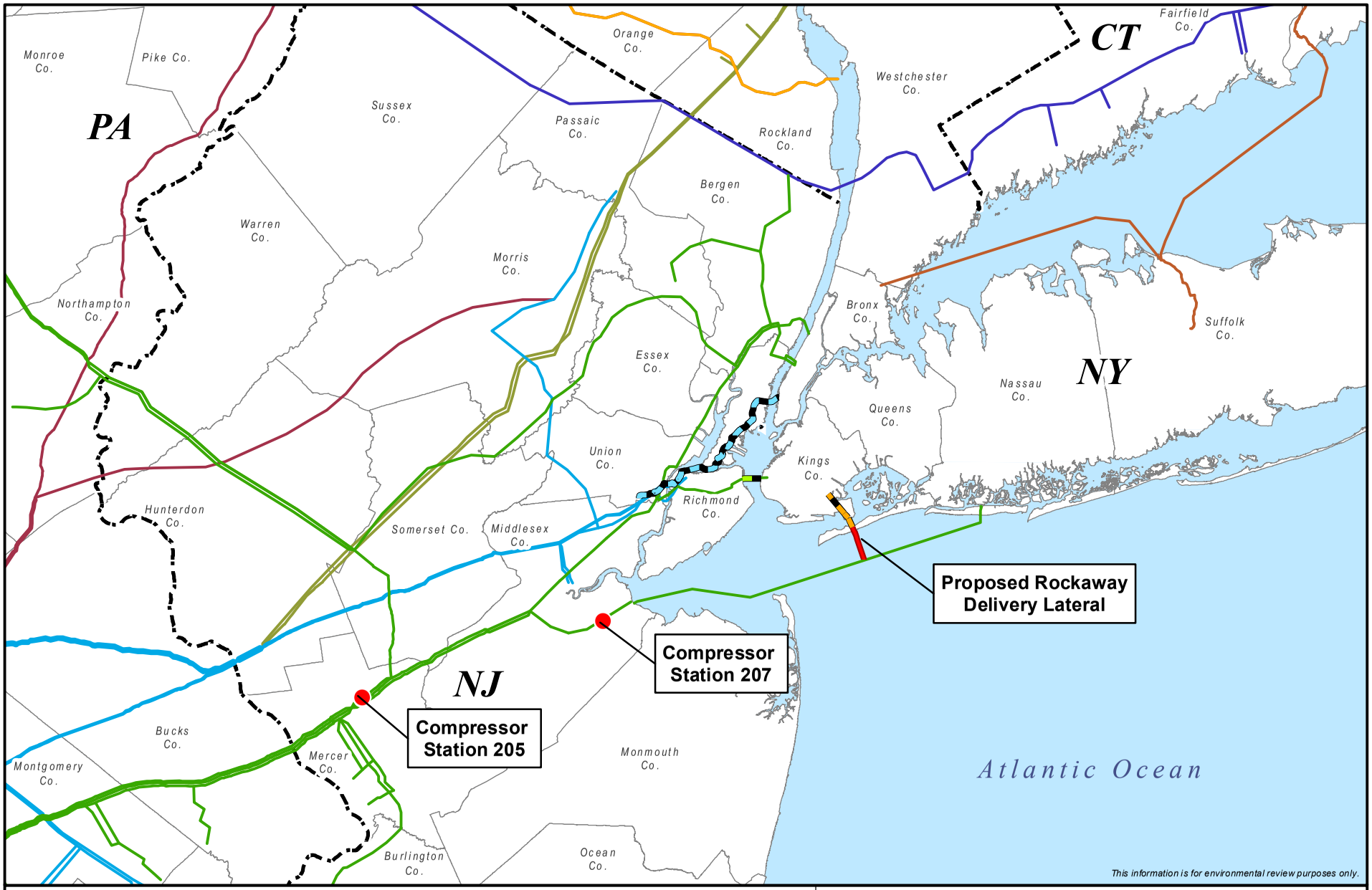

Figure 3.3-1
Rockaway Delivery Lateral and Northeast Connector Projects
Overview of Interstate Natural Gas Pipelines Servicing the Region

3.3.1 Algonquin Gas Transmission, LLC

The existing Algonquin Gas Transmission, LLC (Algonquin) natural gas transmission system is an approximately 1,100-mile-long interstate pipeline interconnecting with the Texas Eastern system in New Jersey and the Maritimes & Northeast system in Massachusetts to bring natural gas supplies to the greater New England area. The current Algonquin system has no direct connection to the National Grid system in New York City. Its closest pipeline facility is near Roseland, New Jersey, which is about 30 miles from the proposed interconnect with National Grid in Queens. Expansion of Algonquin's existing facilities to provide the needed additional delivery point into National Grid in Queens would require many more miles of new pipeline construction, much of it through densely populated areas, and result in much greater environmental impacts than the proposed Projects. For these reasons, we do not believe that expansion of the Algonquin system is a reasonable or practicable alternative to the Projects.

3.3.2 Columbia Gas Transmission

The Columbia Gas Transmission (Columbia) system is the largest interstate natural gas pipeline operating in the northeastern United States, transporting approximately 3,000 MMcf/d of gas through nearly 12,000 miles of pipeline, much of which is located in the Appalachian region. The system interconnects with the Columbia Gulf Transmission system in Kentucky and delivers natural gas to ten states in the northeast, including New York State. As with the existing Algonquin system, the Columbia system has limited connectivity to the New York City market and is more than 30 miles from National Grid's system in Brooklyn. To meet the objectives of the Projects, the Columbia system would require a substantial system expansion, which would result in much greater environmental impacts than the Projects. Therefore, we do not believe that an expansion of the Columbia system is a reasonable or practicable alternative.

3.3.3 Millennium Pipeline Company, LLC

The existing Millennium Pipeline Company, LLC (Millennium) system was constructed in 2008 to replace the Columbia system in southern New York State. The system receives natural gas supplies from the Empire State pipeline system in central New York State and transports these to the Algonquin system at the Ramapo interconnect in Rockland County, New York. Millennium's system does not have a connection with National Grid's system. Any system alternative based on Millennium's facilities would require construction of additional pipeline facilities to connect with National Grid's system in Brooklyn, which is over 40 miles away. Since these facilities would result in much greater environmental impacts than the Projects, we do not believe that expansion of the Millennium pipeline is a reasonable or practicable alternative.

3.3.4 Tennessee Gas Pipeline Company, LLC

Tennessee Gas Pipeline, LLC (Tennessee Gas) operates an extensive interstate pipeline system consisting of approximately 13,600 miles of pipeline bringing incremental gas supplies from the Gulf, Appalachian, and Canadian regions into the Midwest and Northeast regions. As with the Algonquin system, the Tennessee Gas system is a key supplier of natural gas to the New England region, crossing from northern Pennsylvania through southern New York State and on into Connecticut.

The Tennessee Gas system has no connections with National Grid's system in Brooklyn. The closest existing Tennessee Gas delivery or M&R facility is more than 30 miles to the north in River Vale, New Jersey. Thus, any system alternative based on Tennessee Gas' facilities would require construction of 30 or more miles of additional pipeline, which would result in much greater environmental impacts than the Projects. For this reason, we do not believe that expansion of the Tennessee Gas pipeline system is a reasonable or practicable alternative to the Projects.

3.3.5 Iroquois Gas Transmission System, LP

Iroquois Gas Transmission System, LP (Iroquois) is one of the three regional interstate natural gas transmission systems that offer direct access to New York City (Transco and Texas Eastern Transmission, LP [Texas Eastern] are the other two). The Iroquois system, which provides a link to Canadian natural gas supplies through an interconnection with TransCanada Pipelines in northern New York State, delivers natural gas into the New York City metropolitan area through three M&R facilities. Two of these M&R facilities (South Commack and Northport) are located in Suffolk County and provide supplies to National Grid's Long Island system at interconnects more than 30 miles from Brooklyn. The third and closest M&R station, which is located near Hunt's Point in the Bronx about 16 miles from Transco's proposed delivery point, provides supplies directly to Con Edison's New York City system. Expanding this system to service National Grid's Brooklyn-Queens service area would require extensive upgrades, including additional compression and approximately 16.3 miles of new pipeline. This would entail construction of pipeline through densely populated areas and could include open water trenching through Eastchester Bay and/or an HDD route across the East River. Since this would result in much greater impact than the Projects, we do not believe that an expansion of the Iroquois system would be preferable to the proposed Projects.

3.3.6 Texas Eastern Transmission, LP

The Texas Eastern system is a long-haul interstate transmission pipeline providing direct access to New York City. The Texas Eastern system consists of approximately 8,700 miles of pipeline that deliver natural gas from the Gulf Coast and Texas into the New York City metropolitan area. Its current northern terminus is on Staten Island about 16 miles from Transco's proposed delivery point in Queens for the Rockaway Project. Deliveries to Staten Island on the Texas Eastern system are monitored through an M&R facility located on the west side of the Hudson River, in Linden, New Jersey. Texas Eastern is currently constructing the New Jersey-New York Expansion Project. This project includes approximately 20 miles of new and replacement pipeline that would deliver up to 800 MDth/d from Texas Eastern's existing system in Linden to Con Edison's system on the west side of Manhattan.

In order to meet the objectives of the Projects, Texas Eastern would need to construct at least 10 miles of new pipeline across the East River and densely populated and congested areas of Manhattan and Brooklyn or across the Narrows of New York Bay and through densely populated and commercial areas of Staten Island and Brooklyn. Either route would have greater environmental and socioeconomic impacts than the Projects. For these reasons, we do not believe that an expansion of the Texas Eastern transmission system would be preferable to the proposed Projects.

3.3.7 Proposed Constitution Pipeline

Constitution Pipeline Company, LLC (Constitution) has proposed to construct approximately 122 miles of 30-inch-diameter natural gas pipeline and associated facilities from two receipt points in Susquehanna County, Pennsylvania to an interconnection with Iroquois, and through a capacity lease on Iroquois, to delivery points on the Iroquois and Tennessee Gas systems, in Schoharie County, New York. The project would provide 650 Mdth/d of firm transportation service for domestically produced natural gas to customers on the Iroquois and Tennessee Gas systems. If approved, Constitution plans to begin construction of the new pipeline in the third-quarter of 2014 and place the facilities in service in March 2015.

We evaluated the Constitution Pipeline and determined that it would not be a practicable alternative to the Projects. The terminus of the new pipeline would be located about 150 miles to the north of New York City. It would neither provide a direct connection for service into the metropolitan area nor a new delivery point on the Rockaway Peninsula. While the Construction Pipeline could potentially service the metropolitan area via its interconnections with Iroquois and Tennessee Gas, doing so would require the construction of new facilities that would result in greater environmental impact than

the Projects. As noted above, expansion of the Iroquois and/or Tennessee Gas systems would require the construction of about 16.3 miles and 30 miles, respectively, of new pipeline.

3.3.8 Proposed Liquefied Natural Gas Facilities

In the past 10 to 15 years, at least five different LNG projects have been proposed to provide new natural gas supplies to the New York City market. These consist of the Broadwater LNG Project, BlueOcean Energy LNG Project, Liberty Deep Water Port LNG Project, Safe Harbor LNG Project, and more recently, the Port Ambrose Project. All of these regionally proposed LNG projects involve constructing offshore LNG terminals in Long Island Sound or the New York Bight area.

Because of the longer length of offshore and onshore pipelines, each of these LNG projects would have greater marine and terrestrial impacts than the Projects. For these reasons, we do not consider the Broadwater, BlueOcean Energy, Liberty Deep Water Port, or Safe Harbor projects to be reasonable or practicable, or environmentally preferable to the Projects.

Port Ambrose Project

On September 28, 2012, MARAD and the U.S. Coast Guard (USCG) received an application from Liberty Natural Gas, LLC for federal authorizations required for a license to own, construct, and operate a deepwater port (the Port Ambrose Project) under the DWPA.[1] MARAD issued a notice of application for the project in the Federal Register on June 14, 2013. The notice announced that MARAD and the USCG, working in cooperation with other federal agencies and departments, will participate in scoping meetings and prepare an EIS for the project as part of their permitting processes.

The Port Ambrose Project would deliver natural gas from visiting purpose-built LNG regasification vessels (LNGRVs) equipped with LNG vaporization facilities to the New York market. The project would have two major components: two submerged turret loading (STL) buoy systems that would receive and transfer natural gas from the LNGRVs to a pipeline system; and offshore pipeline facilities consisting of two subsea lateral pipelines connected to a buried 21.9-mile-long subsea natural gas mainline. When in use, each STL buoy would be near the surface and connected to a regasification vessel. When not in use, each STL buoy would be lowered to rest on a landing pad on the ocean floor. Natural gas from the LNGRVs would flow from the buoys through the lateral pipelines and into the subsea mainline, which would connect with Transco's existing LNYBL offshore approximately 2.5 miles south of Long Beach, New York and 15.0 miles east of Sandy Hook, New Jersey. This location is about 7 miles northeast of the tie-in between the proposed Rockaway Delivery Lateral and LNYBL.

The LNGRVs would have onboard closed-loop vaporization, metering, and odorant capabilities. Each vessel would have three vaporization units capable of a maximum send-out of 750 MMcf/d with the annual average expected to be 400 MMcf/d. The LNGRVs would be designed to utilize a ballast water cooling system that would re-circulate onboard the vessel during port operations. This would eliminate vessel discharges associated with regasification while vessels are at the port. Deliveries through Port Ambrose would be focused during peak demand winter and summer months. The port would receive up to 45 LNGRVs per year.

If approved with the proposed schedule, the majority of port and pipeline construction would occur no sooner than 2015 with commissioning in December 2015. Consequently, the Port Ambrose project would not meet National Grid's objectives within the timeframe of the proposed Rockaway Project. It would also require a longer pipeline, which would result in greater environmental impacts than the Rockaway Project. Additionally, the Port Ambrose Project would not satisfy one of the key objectives of the Rockaway Project, which is to provide a new delivery point that would allow National

[1] The Port Ambrose facility would be located at a different proposed location and include a different design than the previous deepwater port license application submitted by Liberty Natural Gas, LLC in 2010. Additional information about the project can be viewed at the company's website: http://portambrose.com/project-location/.

Grid to shift existing volumes of natural gas supply from the existing delivery point in Long Beach to the new delivery point on the Rockaway Peninsula. For these reasons, we do not consider the Port Ambrose Project to be a reasonable or practicable alternative to the Rockaway Project

3.3.9 Transco System Alternatives

Long Beach Delivery Point

Transco currently delivers natural gas to the New York City area through four existing delivery points. Two of the delivery points provide natural gas to the Con Edison system in Manhattan and the Bronx. The other two at Fort Hamilton and Long Beach deliver natural gas to the National Grid system in Brooklyn and Queens.

As an alternative to the Rockaway Project, Transco evaluated the potential to service National Grid's market areas in Brooklyn and Queens by increasing supplies through its existing Long Beach facilities. This alternative would eliminate the need for the proposed offshore pipeline and at least some of National Grid's BQI Project (see a description of the BQI Project in Section 1.4 and Appendix B). Transco determined that this alternative would require installing approximately 14.1 miles of new pipeline through the streets of Nassau and Queens Counties, modifying and expanding the existing Long Beach M&R Station, and constructing 2.1 miles of new pipeline between the towns of Lynbrook and Hewlett, New York to address the supply and reliability needs of customers on the Rockaway Peninsula. Thus, while this alternative would minimize offshore impacts, it would require many more miles of pipeline and cross more densely populated areas than the proposed Rockaway Delivery Lateral. It would also have greater impact on residences and commercial businesses, which would be subjected to increased noise, dust, and traffic delays associated with in-street construction.

Due to its greater length and the slow rate of in-street installation methods, the alternative pipeline would take longer to build than the proposed Rockaway Delivery Lateral and would prolong the construction impacts. These related disruptions would increase the negative socioeconomic impact of the alternative, which would likely include lost time and business due to traffic delays and less convenient access. The alternative would also require Transco to take the existing LNYBL pipeline out of service so it could be hydrostatically tested and uprated pursuant to the requirements of 49 CFR 192 in order to move larger gas volumes to the Long Beach delivery point. Finally, the alternative would not provide a new natural gas delivery point into the existing National Grid system in the New York City area to increase system flexibility or the security of National Grid's system, which is one of the main objectives of the Projects.

For these reasons we do not believe an alternative that would deliver gas to Long Beach would be reasonable or environmentally preferable to the Projects.

Proposed Northeast Supply Link Expansion (Long Island Extension Uprate)

Transco evaluated the potential for the proposed volumes and the objectives of the Projects to be met by its Northeast Supply Link Expansion Project, which was approved by the FERC on November 2, 2012 and is scheduled to be in service on November 1, 2014. This project would provide an additional capacity of 250 Mdth/d on Transco's system in the New York City area. Much of this additional capacity would be delivered from Transco's pipeline in Pennsylvania and New Jersey to Transco's existing delivery points at Con Edison's Central Manhattan and Manhattan pooling points. The expansion also includes incremental increases in delivery volume to National Grid along 1.4 miles of the existing 26-inch-diameter Long Island Extension (LIE) pipeline that runs between Staten Island and Brooklyn. To accommodate the increased volume, Transco's existing pipeline would be uprated from the current maximum operating pressure of 350 psig to 517 psig. All work would be at existing aboveground facilities, so the pipeline uprate would not include any ground disturbance.

Transco determined that although this project would supply additional volume to National Grid's Narrows Regulating Vault, it would not be at a level sufficient to provide the anticipated peak demands that would be provided to National Grid by the Projects. Additionally, the uprate would not introduce any new lines, so it would not provide the flexibility of an additional delivery point. Therefore, Transco does not consider the Northeast Supply Link Expansion a suitable alternative to the Projects. We concur with this assessment that the Northeast Supply Link Expansion Project is not a practicable alternative.

Proposed Leidy Southeast Expansion Project

On February 28, 2013, Transco filed an application with the Commission for the proposed Leidy Southeast Expansion (LES) Project. This project would provide an additional 469 Mdth/d of firm incremental transportation service for domestically produced natural gas to customers in the mid-Atlantic region. The LES Project would require the construction of new facilities or the modification of existing facilities in Pennsylvania, New Jersey, Maryland, Virginia, and North Carolina. More specifically, the project would require the construction of 30.1 miles of 42-inch-diameter pipeline in four loop segments; modifications at 11 existing compressor stations along Transco's existing system (including Compressor Station 205) to provide an additional 84,500 hp of compression; and modifications of other aboveground facilities (such as mainline valves and M&R facilities). Assuming the project is approved by the Commission, Transco plans to begin construction in October 2014 and place the facilities in service by December 2015. We evaluated the LES Project and determined that it would not be a practicable alternative to the Projects. As currently proposed by Transco, the LES project is fully subscribed and would not supply natural gas to National Grid. Additionally, it would not provide a new natural gas delivery point into the New York City area, which is a key objective of the Projects.

3.4 ROUTE ALTERNATIVES TO THE ROCKAWAY DELIVERY LATERAL

We evaluated four route alternatives to Transco's proposed route for the Rockaway Delivery Lateral. In general, route alternatives have similar origin and delivery points to the proposed route but they follow different alignments. Route alternatives do not modify or make use of other existing or new pipeline systems. Each of the route alternatives identified for the Rockaway Project originate offshore at Transco's existing LNYBL (albeit at different locations) and connect with National Grid's pipeline at the TBTA property on the Rockaway Peninsula.

Each of the alternative routes was identified in an effort to avoid or reduce environmental impacts. While mostly similar to the proposed route, Alternative Route 1 is a straight line alternative that provides a more direct connection between the LNYBL and the tie-in with National Grid. Alternative Route 2, which is east of the proposed route, would reduce the crossing length of the GNRA and avoid historic districts in the area of Fort Tilden and Jacob Riis Park. Alternative Route 3, which is west of the proposed route, similarly would reduce the crossing length of the GNRA and also would avoid Jacob Riis Park. Alternative Route 4 would avoid a landfall in the GNRA and a crossing of Rockaway Beach by passing west of Rockaway Peninsula and into Rockaway Inlet. The locations of each route alternative and the environmental resources near or crossed by the alternatives are shown in Figures 3.4-1 and 3.4-2.[2]

We considered each of the four route alternatives to determine whether they would avoid or reduce impacts to environmentally sensitive resources that would be crossed by the proposed Rockaway Delivery Lateral. An environmental comparison of the four alternatives to the proposed route is included in Tables 3.4-1 and 3.4-2. A discussion and our conclusions regarding each alternative are presented in Sections 3.4.1 through 3.4.4 below.

[2] In Figure 3.4-2, offshore areas within the 30-foot depth contour are shaded grey.

Figure 3.4-1
Rockaway Delivery Lateral and Northeast Connector Projects
Overview of Pipeline Route Alternatives for the Rockaway Delivery Lateral

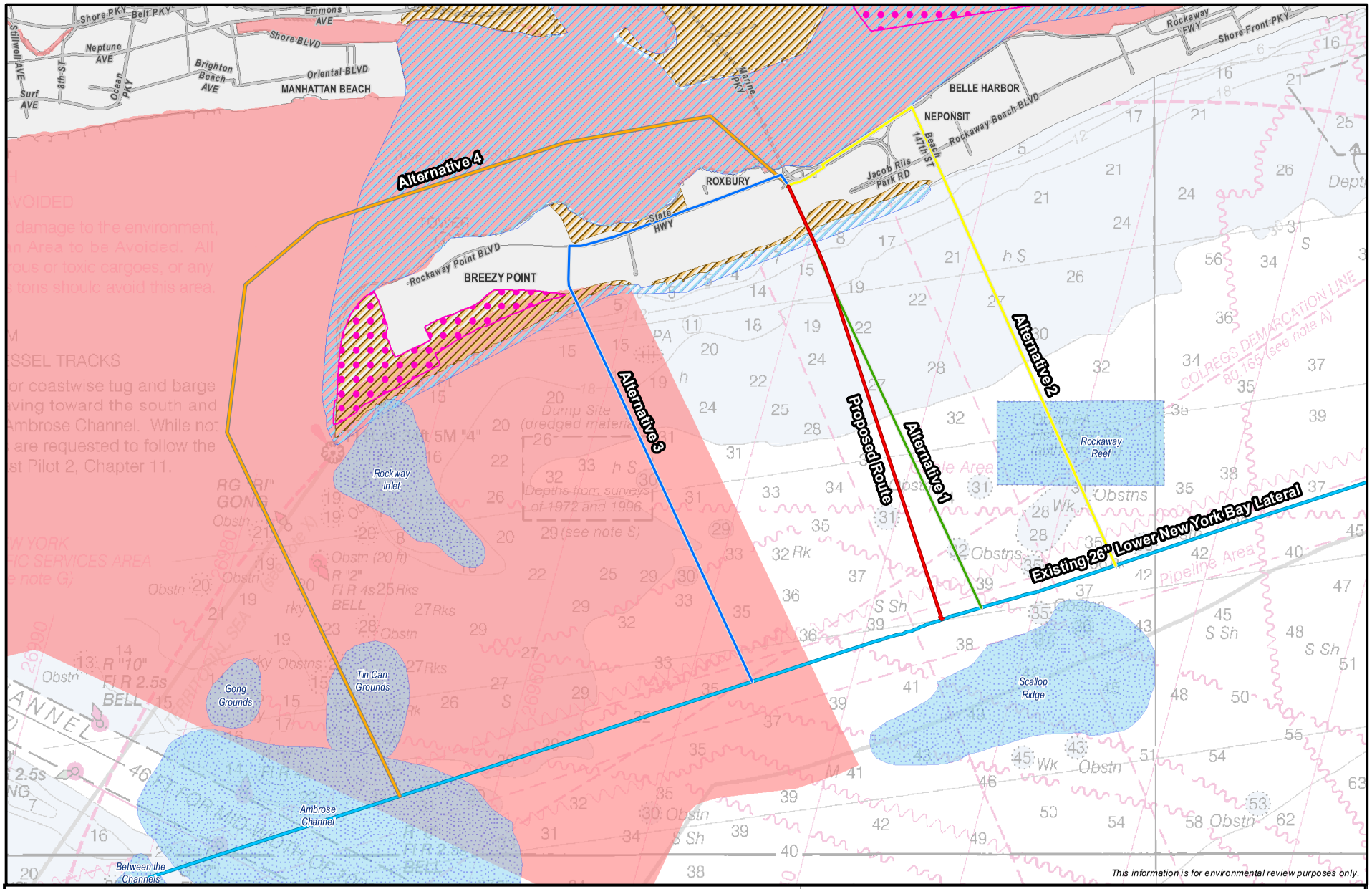

Figure 3.4-2
Rockaway Delivery Lateral and Northeast Connector Projects
Federal and State Significant Habitat Areas - Pipeline Route Alternatives for the Rockaway Delivery Lateral

TABLE 3.4-1
Environmental Comparison of the Alternative Routes to the Proposed Route for the Rockaway Delivery Lateral

Factor	Unit	Proposed Route	Alternative Route 1	Alternative Route 2	Alternative Route 3	Alternative Route 4
Total length	Miles	3.20	3.20	4.50	4.92	7.99
Offshore length	Miles	2.86	2.86	2.91	2.83	7.77
Onshore length	Miles	0.34	0.34	1.59	2.09	0.22
Underwater trenching length	Miles	2.19	2.19	2.79	2.24	7.26
Upland trenching length	Miles	0.01	0.01	1.07	1.92	0.01
HDD length	Miles	1.00	1.00	0.64	0.76	0.72
Total in-water construction period	Months	5	5	5.5	6	6
Total onshore construction period [a]	Months	6	6	6	6	6
Permanent right-of-way	Acres	69.52	69.89	76.16	74.12	150.98
Roadways crossed/co-located [b]	No.	1	1	6	12	4
Co-located roadways	Miles	0.00	0.00	1.36	1.81	0.00
Approximate residences adjacent to right-of-way [c]	No.	0	0	58	93	0
Distance of HDD entry from nearest noise sensitive area	Feet	1,330	1,330	350	70	1,330
Distance of HDD exit from nearest noise sensitive area	Feet	5,970	5,970	1,010	4,100	2,140
GNRA Crossed						
Total length	Miles	0.57	0.57	0.06	0.27	2.44
HDD length	Miles	0.57	0.57	0.05	0.25	0.57
Historic districts crossed (Jacob Riis Park/Fort Tilden)	No.	1	1	1	1	2
Shorelines crossed	No.	1	1	1	1	1
Submarine cable/utility crossings [d]	No.	3	3	3	4	4
Navigation channels crossed	No.	0	0	0	0	1
Marine obstructions within 0.5 mile [e]	No.	4	9	14	3	47
Wrecks within 0.5 mile [e]	No.	0	0	1	3	7
Significant FWS land habitat complex crossed						
Total length	Miles	0.07	0.07	NA	0.08	NA
HDD length	Miles	0.07	0.07	NA	0.08	NA
Significant FWS water habitat complex crossed						
Total length	Miles	0.08	0.08	NA	0.05	3.07
HDD length	Miles	0.08	0.08	NA	0.05	0.54
Tidal wetlands crossed [f]						
Total length	Miles	0.10	0.10	0.04	0.19	0.00
HDD length	Miles	0.10	0.10	0.04	0.19	0.00
Distance to non-adjacent area wetland	Feet	3,765	3,765	3,796	53	2,049

[a] Onshore construction period does not include hangar restoration and M&R facility.
[b] Crossings include beachside boardwalks and HDD crossings.
[c] Visual count obtained from aerial photography. For Alternative 2, residences are adjacent to underground HDD route.
[d] Includes the Lower New York Bay Lateral.
[e] National Oceanic and Atmospheric Administration Electronic Navigation Charts and Automated Wreck and Obstruction Information System data.
[f] NYSDEC.

TABLE 3.4-2
Comparison of the Acres and Cubic Yards of Impact for the Alternative Routes and the Proposed Route for the Rockaway Delivery Lateral

	Proposed Route		Alternative Route 1		Alternative Route 2		Alternative Route 3		Alternative Route 4	
Pipeline Segment/Activity	**Acres**	**Cubic Yards**	**Acres**	**Cubic Yards**	**Acres**	**Cubic Yards**	**Acres**	**Cubic Yards**	**Acres**	**Cubic Yards**
Offshore										
Offshore Pipeline Trenching	16.73	102,800	16.76	103,050	21.35	131,250	17.12	105,250	55.55	341,450
Dive Support Vessel, Lay Barge, Dredge Barge, Anchor Footprints	6.91	-	7.27	-	7.39	-	7.27	-	15.03	-
Jack-up Barge	1.21	39,500	1.21	39,500	1.21	39,500	1.21	39,500	1.21	39,500
HDD Exit Workspace	6.08	15,300	6.08	15,300	6.08	9,850	6.08	9,150	6.08	11,000
Offshore Subtotal	**30.93**	**157,600**	**31.32**	**157,850**	**36.03**	**180,600**	**31.68**	**153,900**	**77.87**	**391,950**
Onshore										
HDD Entry Workspace	0.67	450	0.67	450	0.67	450	0.67	450	0.67	450
Upland Trenching	0.01	250	0.01	250	0.79	19,250	1.43	34,550	0.01	200
Onshore Subtotal	**0.68**	**700**	**0.68**	**700**	**1.46**	**19,700**	**2.10**	**35,000**	**0.68**	**650**
Alternative Total	**31.61**	**158,300**	**32.00**	**158,550**	**37.49**	**200,300**	**33.78**	**188,900**	**78.55**	**392,600**

Assumptions:

- The HDD entry and exit workspaces are considered similar for all alternatives.
- The upland trenching area and volume are based on conventional open-cut pipe lay.
- The offshore pipeline trenching area and volume are based on jet sled trenching and anchor footprints for the pipe lay barge, dive support vessel, and jack-up barge.
- The jack-up barge impact area and volume is considered similar for all alternatives.

3.4.1 Alternative Route 1

Alternative Route 1 ties into the LNYBL about 0.3 mile northeast of the proposed route for the Rockaway Delivery Lateral. From there it proceeds northwest for about 2.2 miles to an alternative HDD exit site adjacent to and just east of the proposed HDD exit site. A short distance later, the alternative route joins and follows the same alignment as the proposed route to the proposed HDD entry location and tie-in with National Grid's pipeline on the TBTA property.

Alternative Route 1 is the same length onshore and offshore as the proposed route and would cross the same number of offshore cables. One difference is that the Alternative is within 0.5 mile of nine charted marine obstructions (U.S. Department of Commerce, National Oceanic and Atmospheric Administration [NOAA], 2009), which is twice the number that are within 0.5 mile of the proposed route (see Table 3.4-2). Transco's 2009 archaeological investigations also revealed that there is a higher number of solid man-made obstacles (e.g., rock and concrete rubble, steel pipes, and cables) east of the proposed route in in the vicinity of Alternative Route 1 (PBS&J, 2009a). Transco believes this is primarily due to the placement of material associated with the establishment of the fish haven (otherwise known as Rockaway Reef) to the east that is indicated on NOAA navigational charts. Regardless of how these artificial materials originated, they provide hard-bottom habitat that supports a population of northern star coral (*Astrangia poculata*) as well as other benthic and fish species (PBS&J, 2009b). Because Alternative Route 1 would disturb a greater number of these submerged obstacles than the

proposed route, it would have a greater impact on this less common hard-bottom habitat than the proposed route.

The onshore portion of Alternative Route 1 is identical to the proposed route and therefore would have the same impacts. Like the proposed route, Alternative Route 1 is not near any New York State Department of State (NYSDOS)-listed critical fish and wildlife habitats, and would cross under the same amount of NYSDEC tidal wetlands and FWS significant water and land habitat complexes using the HDD method. Like the proposed route, it would have minimal onshore impact because the HDD would span the entire onshore area and be located about 1,330 feet from the nearest noise sensitive area (NSA).

While Alternative Route 1 is similar to the proposed route in many respects, it would impact more man-made obstacles in the offshore, which provide habitat for coral and other marine species. For this reason, we have determined that Alternative Route 1 does not offer any significant environmental advantages and would not be preferable to the proposed route.

3.4.2 Alternative Route 2

Alternative Route 2 would tie into the LNYBL about 1.2 miles northeast of the proposed route for the Rockaway Delivery Lateral. From there, it would proceed northwest for about 2.8 miles, generally parallel to but offset by about 0.9 mile from Alternative Route 1, to an alternative HDD exit point near the shoreline. Between this near shore exit point and the HDD entry location in Jacob Riis Park just north of Beach 147th Street, the pipeline would be installed using the HDD method. The path of the HDD would be aligned so it is directly beneath Beach 147th Street to avoid crossing under any homes. From the HDD entry location, the alternative would be installed using conventional onshore techniques along Beach Channel Drive to the National Grid tie-in location on the TBTA property.

Alternative Route 2 is approximately 1.30 miles longer than the proposed route. It crosses a higher number of roads and would require construction of more than a mile of pipeline along Beach Channel Drive. Installation of the pipeline along this roadway would increase the duration of construction, particularly if special construction techniques such as stove pipe or drag section methods are required. It would impact Neponset and Belle Harbor residents by temporarily disrupting traffic and increasing congestion on the road causing travel delays. Additionally, the alternative HDD entry location would be located in Jacob Riis Park on the GNRA as opposed to TBTA property, and would be much closer to residences than the proposed HDD entry location. This would increase impacts on the park and expose more homes to noise impacts than at the proposed HDD site. The primary advantage of Alternative Route 2 is that it would minimize the crossing length of the GNRA. The benefit would be limited since the proposed route would be installed under the GNRA using the HDD method, thereby avoiding any direct impact on resources within the GNRA.

Alternative Route 2 avoids crossing the FWS significant land and water habitat complexes that are crossed by the proposed route, but Transco's use of the HDD method for the proposed route would avoid any impact on these areas. The alternative would utilize a shorter HDD, but this would have the negative effect of placing the offshore HDD operation closer to shore, where it would be more visible and much closer to noise sensitive receptors (e.g., houses) than the proposed route. The alterative HDD alignment would cross under a residential road bordered by approximately 58 homes. While no impact on these residences would be expected, individual homes could be affected if there are complications with the HDD such as surface releases of drilling mud due to an inadvertent release.

Like the proposed route, the majority of the offshore substrate traversed by Alternative Route 2 is sand (U.S. Geological Survey [USGS], 2005c). The alternative route would cross a designated fish haven (i.e., Rockaway Reef) and a much greater number of associated artificial reef structures than the proposed

route. As a result, the trenching for Alternative Route 2 would have a greater impact on the hard-bottom communities and sport fishing grounds than the proposed route. Transco briefly evaluated the potential to avoid these hard-bottom impacts by dramatically increasing the length of the HDD or conducting two back-to-back HDDs, but concluded that this approach would be impractical due to the increased time, cost, and technical difficulties of such an undertaking. Therefore, while the shorter length of the alternative HDD would help reduce the duration of drilling operations compared to the proposed route, the difficulties associated with trenching through the artificial reef area would increase the total duration of the offshore construction period by about 15 days. Further, the additional trenching required for the alternative would increase the total acreage of offshore impacts and result in the excavation of more than 20,000 cubic yards of sediments than the proposed route.

While Alternative Route 2 would reduce the crossing length of the GNRA, it is longer than the proposed route and would result in greater impacts on residents and environmental resources. Construction along Alternative Route 2 would increase traffic on Beach 147th Street, cause direct impacts within Jacob Riis Park, cross a designated fish haven, and result in greater impact on hard-bottom habitat than the proposed route. For these and the other reasons described above, we have determined that Alternative Route 2 does not offer any significant environmental advantages and would not be preferable to the proposed route.

3.4.3 Alternative Route 3

Alternative Route 3 would tie into the LNYBL about 1.4 miles southwest of the proposed route of the Rockaway Delivery Lateral. From there, it would proceed northwest for about 2.3 miles, generally parallel to but offset by about 1.7 miles from Alternative Route 1, to an alternative HDD exit point about 0.6 mile from the shoreline. Between this offshore exit point and the HDD entry location on the south end of Beach 201st Street, the pipeline would be installed using the HDD method. From the HDD entry point, the alternative would proceed northeast within the Beach 201st Street right-of-way following the western boundary of Fort Tilden to Rockaway Point Boulevard. It would then turn and proceed northeast along Rockaway Point Boulevard following the northern boundary of Fort Tilden to the Marine Parkway Bridge interchange. It would then proceed southeast to the tie-in with National Grid's pipeline on the TBTA property.

Alternative Route 3 would completely avoid Jacob Riis Park, but it is approximately 1.7 miles longer and would have more onshore impacts than the proposed route. It crosses a higher number of roads and would require construction of more than 1.8 miles of pipeline along Beach 201st Street and Rockaway Point Boulevard. Installation of the pipeline along and within these roadways would increase the duration of construction, particularly if special construction techniques such as stove pipe or drag section methods are required, and it would impact Breezy Point residents. Transco would need to purchase and remove two residences on Beach 201st Street to complete the HDD. Additionally, construction along Alternative Route 3 would temporarily disrupt traffic and increase congestion on Beach 201st Street and other roads causing travel delays. People living in the 93 residences immediately adjacent to the alternative route would be exposed to noise, dust, and periods of impeded access during construction. The alternative HDD operation would be closer to more residences than the proposed HDD entry location, and the nearest residence would be 70 feet from the HDD entry point. The people living in this home and other nearby homes would be subjected to a prolonged 4-month period of increased visual impacts and noise associated with the HDD.

Alternative Route 3 crosses approximately the same offshore distance and would have about the same amount of offshore impact as the proposed route, but would require approximately 1.4 mile more of onshore trenching. The alternative crosses about the same amount of FWS significant land and water habitat complexes as the proposed route, and direct impacts on these areas would be avoided along both

routes by using the HDD method. Upland workspace for the alternative would be much closer to (within 75 to 300 feet of) sensitive tidal marsh wetland, a FWS-designated significant land habitat complex, and a NYSDOS significant coastal fish and wildlife habitat than the proposed route. Thus, the alternative would have a greater potential to indirectly impact these areas due to sedimentation and stormwater runoff than the proposed route.

Alternative Route 3 would require a shorter (0.76-mile-long) HDD than the proposed route, but it crosses a federally designated dredged-material disposal site for the Rockaway Inlet and comes within 0.5 mile of three named shipwrecks, including the historical vessel Ajace (NOAA, 2009). Trenching within the dump site could suspend contaminated sediments, which (depending on the characteristics of the previously disposed material) could then contaminate the water column. The shipwrecks could also be affected either by sedimentation or physical impacts due to the proximity of the construction activities.

While Alternative Route 3 would reduce the crossing length of the GNRA and avoid direct impacts within Jacob Riis Park, it is longer than the proposed route and would result in greater impacts on residents and environmental resources. Construction along Alternative Route 3 would affect residents in the vicinity of Breeze Point, require the removal of 2 homes, result in greater traffic along Beach 201st Street and Rockaway Point Boulevard, and result in greater visual and noise impacts. Additionally, Alternative Route 3 would pass near three known shipwrecks that could be affected during construction. For these and the other reasons described above, we have determined that Alternative Route 3 does not offer any significant environmental advantages and would not be preferable to the proposed route.

3.4.4 Alternative Route 4

Alternative Route 4 would tie into the LNYBL about 3.9 miles southwest of the proposed route for the Rockaway Delivery Lateral. From there, it would proceed northwest for about 2.8 miles, generally parallel to but offset by about 2.7 miles from Alternative Route 3, until it reaches a point about 0.8 mile west of the tip of Breezy Point. It then would curve north and then northeast roughly parallel to the northern shoreline of the Rockaway Peninsula until it enters the Rockaway Inlet on the north side of the navigation channel. From there, it would proceed up the inlet to a point about 1,600 feet west of the Marine Parkway Bridge. From this in-water location, the pipeline would be installed across the Jamaica Bay navigational channel and the northern shoreline of the peninsula using the HDD method. The HDD entry point and tie-in with National Grid's pipeline would be at the same location on TBTA property as the proposed route.

While Alternative Route 4 would avoid making landfall within the GNRA, it would more than double the length of the pipeline. It would cross approximately 7.8 miles of offshore waters and cross under the Jamaica Bay federal navigation channel within the Rockaway Inlet. The inlet and the navigation channel serve as a high-use corridor for recreational boaters transiting from Sheepshead Bay and Jamaica Bay. Thus, Alternative Route 4 would increase ship traffic congestion within the inlet. This would be especially true during in-water HDD operations. As part of the HDD, a jack-up barge would be set up at the HDD exit point near the navigation channel. This barge and the vessels servicing it would restrict the use of the shipping channel by other vessels. Temporary closures of the inlet may be necessary for limited periods of time to ensure the safety of boaters and the construction contractors.

Alternative Route 4 would pass close to (within 0.5 mile of) 47 mapped marine obstructions, which is ten times the number of marine obstructions near the proposed route. It is likely that at least some of these obstacles may have value as cultural resources. Consequently, the alternative would have a higher potential to impact cultural resources than the proposed route.

Alternative Route 4 would require a shorter HDD but more than three times the amount of offshore trenching as the proposed route (7.3 miles versus 2.2 miles). This trenching would more than double the area of offshore impact and the volume of excavated sediments. Additionally, the alternative route would traverse about 1.0 mile of identified sport fishing areas and 2.5 miles of a FWS significant water habitat complex. Increased sedimentation and decreased water quality caused by the offshore trenching would impact this habitat and potentially have an adverse local effect on sport fishing. The sedimentation and water quality effects of trenching would be exacerbated by the tidal forces within the inlet, which could increase the size of the turbidity plume. Additionally, this plume could be drawn into Jamaica Bay during an incoming tide, diminishing water quality conditions within an area designated as a significant coastal fish and wildlife habitat by the NYSDOS and a critical environmental area by NYSDEC (FWS, 1997). Jamaica Bay provides EFH for additional aquatic species unaffected by the proposed route, including horseshoe crab. The Bay also supports the largest population of diamondback terrapin in New York State.

In addition to the environmental effects described above, Alternative Route 4 would have greater visual impacts on the communities of Breezy Point and Roxbury than the proposed route. Lay barges and support vessels used in trenching and pipe-lay operations would be within 1.0 mile of residential neighborhoods for a majority of the construction period. In contrast, all offshore construction along the proposed route would be more than 1.0 mile from residential communities. In addition, public access to protected fishing locations north of the Rockaway Peninsula that provide recreational and commercial fishing opportunities near the inlet could be negatively impacted by the presence of vessels and equipment during construction of the alternative.

While Alternative Route 4 would avoid a landfall within the GNRA, it is significantly longer than the proposed route and would result in greater impacts on residents and environmental resources. Construction along Alternative Route 4 would require more offshore trenching, which would result in greater turbidity and sedimentation impacts, and also would affect boat traffic along the Jamaica Bay federal navigation channel at Rockaway Inlet. The alternative passes near more marine obstructions that the proposed route and requires crossing a sport fishing area and a designated significant water habitat complex. Construction activities along Alternative Route 4 additionally would result in visual and noise impacts on more residents than the proposed route, particularly at Breezy Point and Roxbury. For these and the other reasons described above, we have determined that Alternative Route 4 does not offer any significant environmental advantages and would not be preferable to the proposed route.

3.5 ALTERNATIVE SITES TO THE M&R FACILITY

We evaluated alternative sites to the proposed M&R facility site to determine whether environmental impacts would be reduced or mitigated by use of an alternative site. Our evaluation covered all of the alternative sites identified by Transco or other interested parties and involved inspection of aerial photography and mapping as well as site visits. In total, we assessed five alternative M&R facility sites. The locations of these sites and the resources on or near these sites are shown on Figures 3.5-1 through 3.5-3. An environmental comparison of the five alternative sites to the proposed site is included in Table 3.5-1 and is presented below.

Figure 3.5-1
Rockaway Delivery Lateral and Northeast Connector Projects
Public Lands -
M&R Facility Site Alternatives for the Rockaway Project

Figure 3.5-2
Rockaway Delivery Lateral and Northeast Connector Projects
NYSDEC Tidal Wetlands -
M&R Facility Site Alternatives for the Rockaway Project

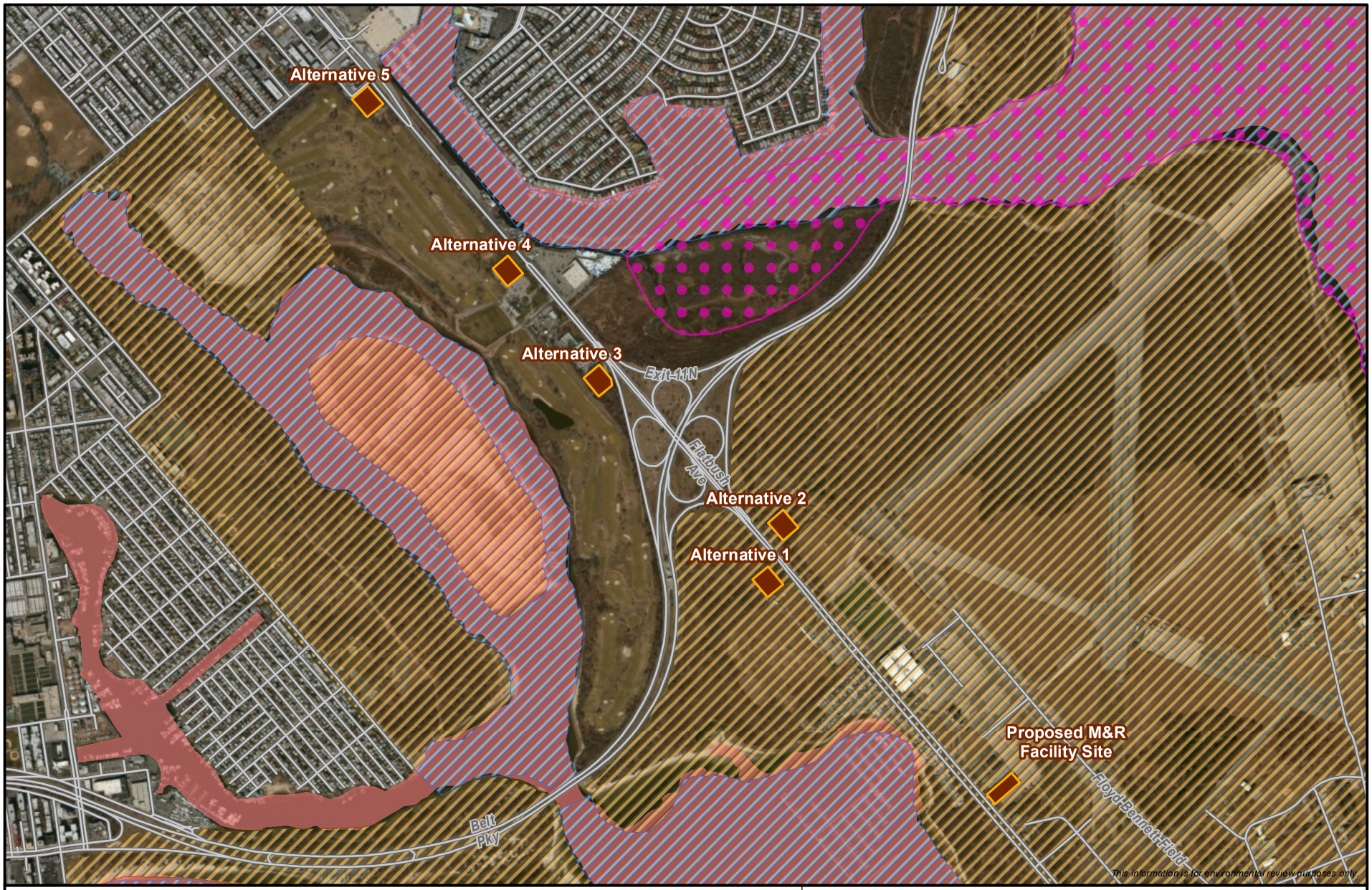

Figure 3.5-3
Rockaway Delivery Lateral and Northeast Connector Projects
Federal and State Significant Habitat Areas - M&R Facility Site Alternatives for the Rockaway Project

TABLE 3.5-1
Comparison of Alternative M&R Facility Sites to the Proposed M&R Facility Site for the Rockaway Project

Factors	Unit	Proposed M&R Facility Site	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Property ownership		NPS	NPS	NPS	NYCDPR	NYCDPR	NYCDPR
Distance to NPS property [a]	Feet	0	0	0	1586	2758	4992
Direct impact on NPS property	Acres	1.1	1.3	1.3	0	0	0
Requires new building on park land (NPS or New York City)	Yes/ No	No	Yes	Yes	Yes	Yes	Yes
Open water within 1.0 mile	Acres	751.27	461.87	414.60	295.30	225.10	170.26
Land within 1.0 mile	Acres	1,377.87	1,663.82	1,711.06	1,829.72	1,900.57	1,957.89
Developed land [b]	Percent	64	54	56	60	67	81
Undeveloped/vegetated land	Percent	36	46	44	40	33	19
Facility footprint [c]: cover type							
Disturbed/open	Percent	100	0	20	50	100	85
Scrub/shrub	Percent	0	100 [d]	80	0	0	0
Deciduous forest	Percent	0	0	0	50	0	15
Distance to closest marina [e]	Feet	964	1773	2245	1238	316	322
Distance to golf course	Feet	3,930	1,020	1,300	50	0	0
Distance to open water	Feet	631	1,593	2,073	800	297	239
Distance to Floyd Bennett Field Community Gardens	Feet	100	3,255	3,545	6,065	7,605	9,990
Buildings [f] within 1.0 mile	No.	140	828	1,035	3,619	6,319	12,376
Buildings [f] within 1,000 feet	No.	11	12	4	9	51	111
Significant land habitat complex within 0.25 mile (FWS)	Acres	131.9	133.6	133.3	2.1	2.1	5.9
Significant water habitat complex within 0.25 mile (FWS)	Acres	24.5	0.0	0.0	15.6	36.5	23.3
Distance to non-adjacent area tidal wetlands (NYSDEC)	Feet	664	1537	2017	504	277	223
Distance to significant coastal fish and wildlife habitat (NYSDOS)	Feet	4626	2610	2056	845	1139	3126

Notes:

[a] NPS boundary source: http://science.nature.nps.gov/nrdata/datastore.cfm?ID=47593.

[b] Developed land includes golf courses.

[c] Cover type determined by desktop verification of 2006 National Land Classification Data using aerial photography.

[d] Classified as estuarine Intertidal by the New York Natural Heritage Program (Edinger et. al. 2008).

[e] Distance is from each station to the closest marina dock.

[f] Includes residences, commercial, and public buildings

3.5.1 M&R Facility Alternative Site 1

M&R Facility Alternative Site 1 is located on undeveloped land to the southeast of the Belt Parkway-Flatbush Avenue interchange on the west side of Flatbush Avenue about 0.25 mile west of the Aviator Sports and Recreation Complex. The site is in a portion of Marine Park that was previously donated to the GNRA, and thus is on NPS property. The site is outside the Floyd Bennett Field Historic District boundary (see Section 4.10.1), but within the viewshed of this area. The entire site is classified as containing estuarine intertidal vegetation by the New York Natural Heritage Program (NYNHP).

The primary advantage of Alternative Site 1 relative to the proposed site is that it would avoid temporary construction impacts on users of a community garden at Floyd Bennett Field. Because workspace for the proposed site is located about 100 feet from the garden, gardeners could be disturbed by the temporary increase in noise, vibration, and traffic during construction. These impacts would be avoided at Alternative Site 2, which is located 3,255 feet to the northeast of the garden.

A major drawback of Alternative Site 1 is that it would require the development of new industrial buildings within the GNRA. These buildings would be visible from Flatbush Avenue and from approximately 55.0 acres of NPS property. As such, they would detract from the visual aesthetics of the GNRA and impact the historic district by creating a new permanent structure within its viewshed. In contrast, although the proposed M&R facility would be visible to a greater portion of the GNRA, Transco's adaptive reuse of a rehabilitated hangar complex would match the visual character of Floyd Bennett Field. Consequently, the primary visual impact of the proposed site would be temporary during the period of construction; the long-term effect would be a rehabilitation of a cultural resource site (assuming the rehabilitation is approved by the appropriate agencies).

With respect to natural resources and protected areas, both the proposed M&R facility site and Alternative Site 1 are within a mapped FWS significant land habitat complex, but there are significant differences between the vegetation on the two sites. Alternative Site 1 is covered by marsh vegetation and its development would result in both temporary and permanent vegetation impacts, including the permanent loss of approximately 1.3 acres of reed grass dominated wetland habitat. Transco has speculated that it might be possible to reconfigure the facilities at Alternative Site 1 to reduce the wetland impacts, but the access road to the facility and the pipelines connecting the facility to National Grid's pipeline along Flatbush Avenue would still impact about 1.0 acre of wetlands. Additionally, any reconfiguration to reduce wetland impacts would likely increase the impact on the bordering northern hardwood vegetation. The proposed M&R facility site, by comparison, is mostly paved and contains sparsely distributed upland grasses growing through the broken pavement. As such, the proposed site would have a negligible impact on vegetation within the GNRA.

In summary, while Alternative Site 1 would avoid temporary impacts on users of the community garden at Floyd Bennett Field, use of the site for the M&R facility would result in greater visual impacts on the GNRA due to the construction of new buildings in the viewshed. Additionally, use of Alternative Site 1 would result in impacts on marsh vegetation, including permanent impacts on reed grass dominated wetland, whereas the proposed site would avoid these impacts. For all these reasons, we have determined that Alternative Site 1 does not offer any significant advantages and would not be preferable to the proposed site.

3.5.2 M&R Facility Alternative Site 2

M&R Facility Alternative Site 2 is located north of the proposed site within the GNRA on land under the jurisdiction of the NPS. It is about the same distance from the Aviator Sports and Recreation Complex as Alternative Site 1, but on the east side of Flatbush Avenue. This area consists of open

uplands and is referred to by the NPS as the North Forty Natural Area. Alternative Site 2 is also within the Floyd Bennett Field Historic District boundary.

Alternative Site 2 shares the same advantages and disadvantages as Alternative Site 1 relative to the proposed site. The primary advantage Alternative Site 2 is that it would avoid temporary construction impacts on users of a community garden at Floyd Bennett Field; the alternative is located about 3,545 feet from the community garden compared to a distance of about 100 feet for the proposed site. A key disadvantage is that Alternative Site 2 would require the development of new industrial buildings within the GNRA. These buildings would be visible from both Flatbush Avenue and surrounding areas within the GNRA. Additionally, Alternative Site 2 would be within the same mapped FWS significant land habitat complex as Alternative Site 1, and development of the site would permanently impact about 1.0 acre of maritime scrub-shrub habitat on NPS property.

In summary, while the use of Alternative Site 2 would avoid temporary impacts on users of community garden, it would result in impacts on visual and natural resources within the GNRA, including maritime scrub-shrub habitats. Use of the proposed site would avoid these impacts because the M&R facility would be built within a rehabilitated hangar complex at Floyd Bennett Field and construction activities would affect sparse herbaceous vegetation growing through pavement. For these reasons, we have determined that Alternative Site 2 does not offer any significant advantages and would not be preferable to the proposed site.

3.5.3 M&R Facility Alternative Site 3

M&R Facility Alternative Site 3 is located on NYCDPR-owned property on the Marine Park Golf Course. The partly open and partly wooded site is next to a New York State Department of Transportation (NYSDOT)-NYCDPR maintenance facility northwest of the Belt Parkway-Flatbush Avenue interchange and west of Flatbush Avenue. Alternative Site 3 is located outside of the GNRA and would not be subject to NPS jurisdiction.

Marine Park is Brooklyn's largest park (798 acres outside of GNRA boundaries) consisting of open water, grassland, saltmarsh, and maintained recreational lands (NYCDPR, 2012). Recreational opportunities in the park include a golf course, bocce courts, baseball fields, basketball courts, playgrounds, camping, hiking, canoeing, and kayaking (with a launch at Gerritsen Inlet). Alternative Site 3 is not located in any designated natural areas, but it is approximately 1,238 feet away from the Sea Travelers Marina to the northeast, 800 feet away from the nearest open water to the west, and within 0.25 mile of two FWS-designated significant water habitat complexes (the Mill Basin and Marine Park waterbodies) and a NYSDOS-designated significant critical fish habitat area. Because of this distance and Transco's implementation of a Storm Water Pollution Prevention Plan (SWPPP), impacts on water quality associated with stormwater runoff and on fishing and other water-dependent recreational activities likely would be negligible.

Roughly half of Alternative Site 3 is forest land, which would have to be cleared, resulting in the permanent loss of woodlands. Additionally, although the alternative location is not located within and would not likely be visible from the GNRA, it would still be clearly visible to users of the Marine Park Golf Course and from vehicles using Flatbush Avenue.

While use of Alternative Site 3 would avoid impacts on gardeners in the community garden at Floyd Bennett Field (the site is located about 6,065 feet to the northeast of the garden), it would affect existing land uses at Marine Park. The alternative site is in an area used for park vehicles and equipment. Construction of an M&R facility at this location would require the relocation of park vehicles and equipment to another area, which could lead to secondary impacts on land uses or on vegetation. Additionally, as city property, the use of Alternative Site 3 would require alienation of parkland through

the state legislature for a new M&R facility to be built. This would be particularly challenging for Alternative Site 3 because the NYCDPR deemed this alternative the least appealing due to land use conflicts and concerns about the amount of useable space, as portions of the site have been ceded to the New York City Department of Transportation (NYCDOT).

While use of Alternative Site 3 would avoid temporary impacts on gardeners at Floyd Bennett, it would result in greater impacts on natural, land use, and visual resources than the proposed site. Use of Alternative Site 3 would require the clearing of woodland, conflict with existing uses at the site, and disrupt existing viewsheds at Marine Park. Use of the proposed site would avoid these impacts. For these reasons, we have determined that Alternative Site 3 does not offer any significant advantages and would not be preferable to the proposed site.

3.5.4 M&R Facility Alternative Site 4

M&R Facility Alternative Site 4, like Alternative Site 3, is located on NYCDPR-owned property on the Marine Park Golf Course west of Flatbush Avenue. The site is in a vacant parking lot adjacent to the main parking area of the golf course. Views of the site are currently screened from Flatbush Avenue by a double line of deciduous trees between the parking lot and the road.

Alternative Site 4 is located outside of the GNRA and would not be subject to NPS jurisdiction. Its development would avoid temporary impacts on gardeners at Floyd Bennett Field relative to the proposed site, and would have fewer visual impacts on the GNRA than Alternative Sites 1, 2, or 3. It would have greater direct and indirect impacts on Marine Park because it would occupy a portion of the golf course parking lot. During construction, access to the golf course and parking lot would be limited by the storage of equipment and materials and by the movement of construction vehicles in and out of the site. Additionally, a portion of the existing parking lot would be permanently lost and converted to non-recreational industrial use, and the construction of new buildings could disrupt existing viewsheds from the golf course or other areas of the park.

Alternative Site 4 is close to the Sea Travelers Marina and open water and is within 300 feet of Mill Basin, a FWS-designated significant water habitat complex, though these areas most likely would be unaffected by construction at the site. Development of the site would disturb, and possibly eliminate, the semi-natural vegetation that currently borders the edges of the site. In addition, as city property, the use of Alternative Site 5 would require alienation of parkland through the state legislature for a new M&R facility to be built.

In summary, while use of Alternative Site 4 would avoid impacts on gardeners at Floyd Bennett Field as well as visual impacts on the GNRA, it would impact existing land uses and viewsheds at Marine Park and would disturb semi-natural vegetation around the site in areas adjacent to the golf course. Use of the proposed site would avoid impacts on Marine Park, including impacts on the golf course. For these reasons, we have determined that Alternative Site 4 does not offer any significant advantages and would not be preferable to the proposed site.

3.5.5 M&R Facility Alternative Site 5

M&R Facility Alternative Site 5 is located the furthest north of any of the alternative sites near a complex of commercial buildings just south of the intersection of Avenue V and Flatbush Avenue. The land, which sits on the northeast corner of the Marine Park Golf Course, is partially open and partially wooded. As with Alternative Sites 3 and 4, the property is owned by NYCDPR.

Alternative Site 5 is located on city property farther from the GNRA than any other site. While there is a direct line of sight to the property from the north side of the Rockaway Peninsula and the west side of Floyd Bennett Field, the distance is so great that a M&R facility at this location would have little

visual impact on users of the GNRA. Additionally, use of this site relative to the proposed site would avoid temporary impacts on gardeners at the community garden on Floyd Bennett Field.

Development of the Alternative Site 5 would have a direct impact on the Marine Park property by removing vegetation and erecting new buildings in a previously open and wooded area. The alternative site additionally is directly adjacent to both the golf course and the King's Plaza commercial development. As such, golf course operations and commercial activities at King's Plaza could be affected by increased vehicle traffic during the period when the alternative site is being developed.

Construction of new M&R facility buildings within Marine Park would have a long term visual impact on golfers and other visitors to the golf course. Development of the site would result in the removal of about 0.2 acre of trees that screen the property from the surrounding area. The removal of these trees would change the visual character of the Marine Park Golf Course, King's Plaza, and Flatbush Avenue. Additionally, Alternative Site 5 is located about 300 feet from Mill Basin, a FWS significant water habitat complex. It is also close to the Kings Plaza Marina, whose customers could be visually impacted and subject to other construction-related impacts. In addition, as city property, the use of Alternative Site 5 would require alienation of parkland through the state legislature for a new M&R facility to be built.

In summary, while use of Alternative Site 5 would avoid temporary impacts on gardeners at Floyd Bennett Field as well as the introduction of new visual impacts on the GNRA, it would have significant visual impacts on Marine Park and nearby commercial areas due to construction of new buildings and removal of trees and other vegetation. Use of the proposed site would avoid these impacts. For these and the other reasons described above, we have determined that Alternative Site 5 does not offer any significant advantages and would not be preferable to the proposed site.

3.6 ALTERNATIVES TO THE NORTHEAST CONNECTOR PROJECT

For the Rockaway Project, Transco would provide firm delivery service of 647 Mdth/d of natural gas to National Grid's distribution system on the Rockaway Peninsula in Queens County, New York. For the Northeast Connector Project, Transco would add additional compression at three existing compressor stations along its mainline to provide, as part of the 647 Mdth/d, 100 Mdth/d of new incremental natural gas supply on Transco's existing system. We considered alternatives to the Northeast Connector Project, including modifications to other existing compressor station sites, construction of an additional compressor station, and construction of a pipeline loop[3] near Compressor Station 195, each of which could provide 100 Mdth/d of new incremental natural gas supply on Transco's existing system.

We concluded that Transco's existing compressor stations are situated to maximize the efficient transportation of gas volumes through its mainline system. The additional volumes of natural gas proposed by the Northeast Connector Project would not require the construction and corresponding environmental impacts of a new compressor station. Further, Transco proposes to modify the three compressor stations closest to the Rockaway Project area, which would maximize its existing system efficiency. If Transco were to avoid modifications at Compressor Station 195 and modify a different station, the environmental impacts associated with this action would not be avoided, but shifted from one site to the other.

Another option would be to loop the existing mainline downstream and possibly upstream of Compressor Station 195. Construction of a pipeline loop would affect approximately 12 acres of land per mile of pipeline and would create more impacts than those proposed by the Northeast Connector Project.

[3] A pipeline "loop" is a segment of pipeline that is installed adjacent to or in the vicinity of an existing pipeline and connected to the existing pipeline at both ends. A loop increases the volume of gas that can be transported through that portion of the system.

Therefore, the construction of a pipeline loop would not be preferable to the proposed action because it would result in greater environmental impact than Transco's proposed modifications at Compressor Station 195.

For all these reasons, we do not believe that alternatives to the Northeast Connector Project offer any significant environmental advantages, nor would these alternatives be preferable to the proposed action.

3.7 CONSTRUCTION ALTERNATIVES

We evaluated construction alternatives for the Rockaway Project to determine whether offshore environmental impacts could be reduced or mitigated by use of alternative methods. Our evaluation included a review of alternative offshore trenching methods, the use dynamically positioned vessels verses anchored vessels to assemble and install the pipeline, an open-cut crossing of the shoreline as opposed to the proposed HDD, and removal of drilling fluids released to the marine environment rather than allowing the fluids to collect and remain in the offshore HDD exit pit. A description of each of these alternatives and a comparison to the proposed methods is presented below.

3.7.1 Subsea Pipeline Trenching Alternatives

Transco evaluated two alternative subsea trenching methods in addition to the proposed post-lay jetting method. One of these alternatives would be to use a post-lay subsea plow. The other would involve the use of a pre-lay clamshell dredge. A comparison of these alternative trenching techniques compared to the proposed method is presented in Table 3.7.1-1 and described below.

Post-Lay Plowing

A post-lay subsea plow involves passive displacement of soils by a plowshare as it is pulled forward. Plowing uses a pull-barge or vessel force to overcome resistance of the plow being drawn through subsea sediments and it is best suited to consistent silty clay sediments.[4] The pull force is supplied by a special pull barge or the lay barge itself. Steering is normally accomplished by offset or tow angle of the vessel or by articulated steering. Because of the size of the plow equipment, plowing is generally not suitable in shallow waters, but could be used for the Rockaway Project where water depths range from 20 to 39 feet. The width of the trench created by post-lay plowing would be approximately 30.5 feet. Another 45 feet of seabed would be impacted by the displaced sediments pushed to the side of the trench by the plow. The primary advantages of plowing relative to jetting are that it would reduce the volume of displaced sediment, the size of the resulting sediment plume, and the extent of sedimentation away from the trench.

Acquiring a plow may not be possible for construction of the Rockaway Delivery Lateral. There are a limited number of plows that are commercially available for large-diameter pipeline construction within U.S. waters, and these plows typically are used on larger projects. Transco requested qualifications from nine U.S. based offshore construction companies for work on the pipeline. Of these, seven companies responded to a questionnaire regarding available construction equipment, including a plow. Of the seven respondents, one company owned a plow. The availability of this plow would be at the discretion of the plow owner and the cost could be significantly higher than jetting because of the limited availability. In consideration of availability, cost, and existing aquatic resources in the project area, we determined that use of a post-lay plow would not offer a significant environmental advantage for the Rockaway Project.

[4] As discussed in Section 4.1.2, the near surface sediments along the offshore pipeline route consist of fine to medium sand.

TABLE 3.7.1-1
Comparison of Offshore Pipeline Trenching Methods for the Rockaway Project

Consideration	Proposed Post-Lay Jetting [a]	Post-Lay Plowing [b]	Pre-Lay Dredging (Clamshell)	Comments
Water depth limitation(s)	Within project water depth	Within project water depth	Within project water depth	
Equipment availability	Fairly available	Low	Fairly available	Availability of a plow capable of trenching a 26-inch line is extremely limited.
Estimated trenching speed (feet/hour)	1,200	600 to 3,300	15	
Trench slope	1V:5H	1V:3H	1V:3H	Based on vendor input. May vary depending on the shear strength of seabed sediments.
Excavation depth (feet)	6.50	6.50	6.50	Designed to achieve 4 feet of cover between the seabed and the top of the pipe.
Trench top width (feet)	70.0	30.5	44.0	
Trench top plus sediment placement width (feet)	70.0	75.50	77.0	The jetting method does not require an area for the placement of the excavated sediments.
Equipment size (feet)	22 x 24	30 x 60	15 x 25	
Equipment weight (tons)	~ 30	~ 150	Not applicable	The clamshell excavator would be mounted on a barge and would not be resting on the seabed.
Seabed impact due to trenching (acres)	16.73	17.93	18.33	Impact for the offshore trench. Acreage estimates for the mechanical plow and clamshell dredge include an area for the placement of the sediment excavated from the trench.
Sediment displaced ($yard^3$)	~102,800	~36,500	~67,100	Impact based on the trench dimensions identified in the rows below. Volume estimates include a 10 percent contingency.
Suspended sediment plume – bottom layer	Most extensive	More extensive	Least extensive	Based on distance travelled and concentration of suspended sediments, not the duration of sedimentation.
Extent of sedimentation	Most extensive	Least extensive	More extensive	Extent of sedimentation is a function of the disturbed trench volume rather than the trenching rate.
Construction period and duration of impacts	Shortest	Varies	Longest	Mobilization time for plow equipment would be several months
Construction cost	Least expensive	Most expensive	High	The high cost of plowing is due to the scarcity of available equipment.

[a] Jet sled equipment based on information received by Transco from Cal Dive.
[b] Plow equipment based on information received by Transco from Soil Machine Dynamics LTD.

Pre-Lay Dredging

Unlike the proposed post-lay jet sled that would excavate the trench after the pipeline is laid on the seabed, a pre-lay clamshell dredge would excavate a trench before the pipeline is laid using a barge-mounted crane and mechanical bucket. A clamshell dredge is suitable for silt, sand, or rubble substrate and thus would be capable of excavating the seabed material crossed by the pipeline route. The excavated material could either be deposited to the side of the trench or lifted to the surface and stored upon a barge for backfill. Efficient filling of a barge requires that any water entrained in the excavated sediment be drained before it is stored onboard the barge. This process results in an increase in the amount of sediment released into the water column by roughly ten-fold compared with the clamshell alone (Palermo

et. al., 2008). To minimize the potential for this impact, the scenario evaluated in Table 3.7.1-1 assumed that the material would be deposited on the side of the trench, but this also would increase the area of seabed impact.

Another issue with pre-lay dredging is the potential for sloughing and natural infilling to occur in the trench in the period before the pipe is laid on the seabed. If this occurs, more dredging would be necessary and additional impacts could occur. Additionally, the rate of clamshell dredge operation is very slow in comparison to a mechanical plow or jet sled. This would prolong the duration of the impact.

For all these reasons, we believe that the impacts associated with the use of a clamshell dredge would negate any potential advantages it may have over jetting. Therefore, with the exception of the HDD exit pit, we do not think that it would be preferable to the proposed post-lay jetting method to excavate the offshore trench.

3.7.2 Dynamically Positioned Pipe Lay Barge Alternative

Transco proposes to use a pipe lay barge to fabricate the offshore pipeline. As described in Section 2.3.1, the pipe lay barge would be moored with pre-positioned anchors for installation of the offshore section of the Rockaway Delivery Lateral. An eight-point mooring system of wire ropes and anchors would hold the lay barge on a precise heading as the pipeline is laid. The system would move the barge as anchor lines are reeled in and out. As the barge progresses to the end of the mooring lines, the anchors would be moved ahead by anchor-handling tugs. The wide spread of the mooring system would require Transco to use a 5,000-foot-wide construction right-of-way. Mariners would be temporarily precluded from using this corridor during construction. Additionally, while Transco's use of mid line buoys would minimize seabed impacts by reducing cable sweep, impacts associated with each anchor strike would occur in isolated areas throughout the 5,000-foot-wide corridor.

We evaluated the potential to avoid these effects by using a dynamically positioned pipe lay barge that would maintain its location using a system of hull-mounted thrusters rather than an anchoring system. We determined that a dynamically positioned pipe lay barge would not be practicable because the minimum water depth of a pipe lay barge operating with dynamic positioning is approximately 100 feet, and the associated barge draft would be approximately 30 feet. The range of water depth for the pipe lay operation is approximately 25 to 40 feet, so the thrusters on a dynamically positioned lay barge could not operate without excessive turbulence and disturbance of the seabed. As such, we do not believe that use of a dynamically positioned lay barge would be preferable to the proposed lay barge equipment.

3.7.3 Open-Cut Crossing of the Shoreline

Transco proposes to cross the shoreline and nearshore marine environments, including areas within the GNRA, using the HDD construction method. In response to comments from the USACE, we evaluated an open-cut crossing alternative to the HDD. This alternative would require the use of conventional construction techniques for the upland, onshore segment from the tie-in with National Grid to the start of the beach at Jacob Riis Park; special construction methods, including trenching from a dredge barge, for the beach crossing segment extending across the beach and into shallow waters of the ocean to a depth of about 10 feet; and offshore dredging from a dredge barge for the offshore segment from a water depth of about 10 to 25 feet, which is the minimum depth required for use of the jet sled.

For the upland, onshore segment, the pipeline would be installed at a depth sufficient to provide a minimum of 3 feet of cover measured from top of pipe to grade. This would require a construction right-of-way measuring 85 feet in width and could require an additional 25 feet of temporary workspace (for a total construction work area measuring 110 feet in width) for segregating and storing excavated spoil,

particularly within the pitch-and-putt golf course on Jacob Riis Park. Construction methods for onshore clearing, grading, and backfilling would be similar to those described in Section 2.3.1.10 for the proposed action. Following installation of the pipeline, the disturbed area would be restored to pre-construction condition or better in accordance with NPS requirements.

For the beach crossing segment, the pipeline would be installed at a depth sufficient to provide a minimum of 15 feet of cover measured from top of pipe to grade. Transco would require a construction right-of-way measuring 350-feet-wide from the beach boardwalk, which is about 260 feet back from the water's edge, to the waterline and 300-feet-wide in the shoreline waters. For the beach crossing, the open-cut construction method would be implemented. A dredge barge would excavate a 100-foot-wide flotation canal for the barge to transit to the shoreline for trenching activities. Prior to excavation, sheet piles would be installed both along the shoreline and the trench line from at least the water's edge to a water depth of five feet to maintain the integrity of the trench walls during construction. The dredge would excavate a trench from the shoreline to the 10-foot water depth. A lay barge would be used to assemble and lay the pipe. A winch would be installed near the boardwalk to pull the pipeline segment from the lay barge into the trench across the beach. The sheet piles would be removed and the trench would be backfilled with native and/or clean compatible material. Disturbed areas of the boardwalk and beach would be restored to preconstruction condition or better.

For the offshore segment, the pipeline would be installed at a depth sufficient to provide 4 feet of cover measured from top of pipe to grade. Transco would require an offshore construction workspace measuring 5,000 feet in width to provide sufficient space for vessel anchoring and maneuvering and a construction right-of-way measuring 300 feet in width to install the pipeline. A dredge barge would be utilized to excavate the trench. A pipe lay barge would be used to assemble and lay the pipeline segment out to a depth of 25 feet. The jet sled would be used to trench the remainder of the offshore pipeline to the tie-in with the LNYBL as discussed in Section 2.3.1.4. Following installation of the pipeline, the trench would be backfilled with native and/or clean compatible materials and the seafloor graded to ambient contours.

We compared the potential environmental impacts of an open-cut crossing at the shoreline to those for an HDD. The open-cut alternative would result in direct impacts on the GNRA and would require the temporary closure of the pitch-and-putt golf course, boardwalk, and beach at Jacob Riis Park. The open-cut alternative also would disturb sensitive beach and nearshore ocean habitats, including areas identified by the FWS as significant land or water habitat complexes, resulting in impacts on terrestrial and marine species and federally listed species in these areas. Construction activities for the offshore segment additionally would result in turbidity and sedimentation impacts in the nearshore waters within the GNRA. In contrast, use of the HDD method to install the pipeline at the shoreline crossing would avoid impacts on land uses within the GNRA, onshore and nearshore habitats within the GNRA, and nearshore water quality impacts due to turbidity and sedimentation. We also note that the pipeline would be installed at a depth of 100 feet below grade at the shoreline using the HDD method compared to a depth of 15 feet using the open-cut method. The additional depth of the HDD would increase the protection of the pipeline at the shoreline. For all these reasons, we do not believe that use of the open-cut method to install the pipeline at the shoreline crossing would be preferable to the HDD.

3.7.4 Drilling Fluid Removal

Under the proposed action, Transco would excavate a pit at the offshore HDD exit location to contain the drilling fluid and cuttings released to the marine environment during the drilling process. The drilling fluid would consist of a mix of fresh water and bentonite clay. Upon discharge, the drilling fluid would be of a gel-like consistency that is denser than seawater. As such, it is expected to pool within the pit as it releases from the drill hole. The salinity of the surrounding seawater would cause the clay within

the drilling fluid to flocculate and settle to the bottom of the pit. Transco proposes to leave the drilling fluid and cuttings in the pit but would cover the area with a top layer of native and/or compatible sediments to cap the material and restore the contours of the seabed.

In response to comments from cooperating and other agencies, we evaluated removal of the drilling fluid from the pit as an alternative to the proposed action. Crane-operated air-lift or suction pump equipment could be used to extract the drilling fluid from the pit on a continuous basis (though it would be difficult to measure or observe the volume of fluid removed due to mixing with native sediment and seawater during withdrawal). The fluid and other materials would be discharged from the pump equipment to a barge at the surface of the ocean and dewatered to remove the seawater. The barge would then transport the material to a dock for transfer to trucks and delivery to a disposal facility licensed to receive material contaminated by seawater. Transco estimates that four barges, each with a tug escort, would need to be rotated to and from the offshore construction area to handle the volume of material recovered from the pit during the HDD operations (including sediment and seawater captured by the air-lift or suction pump) and ship it to the shore. Once at shore, between 600 and 1,200 trucks (depending on truck size) would be needed to transport the material to licensed disposal facilities. Due to limitations on the amount of ocean sediment that the disposal facilities are able to receive on a daily basis (as a result of the salt content), multiple facilities would be required to dispose of the recovered material. Transco estimates that 11 or more disposal facilities throughout the region (some as far away as Pennsylvania, Ohio, and Virginia) would be utilized to dispose of the material recovered from the HDD exit pit.

We compared the potential environmental impacts of drilling fluid removal to Transco's proposal to allow the material to collect and remain in the HDD exit pit. Removal of the drilling fluid would require an additional one to two weeks of in-water construction and result in greater impacts on the marine environment. Use of the air-lift or suction-pump equipment would create a turbidity plume on the seafloor as native substrate and seawater become entrained during withdrawal. Any fish eggs or larvae in the entrained seawater would perish. Additionally, because of the entrained sediment and seawater, a turbidity plume could occur at the ocean surface as a result of dewatering as the recovered material is deposited on the barges. Water quality impacts also could occur dockside due to runoff as the drilling fluid is transferred from barges to dump trucks. Runoff at the dock could require additional containment. Removal of the drilling fluid also would result in more air emissions than the proposed action due to operation of the air-lift or suction-pump equipment, barges and support tugs, shore transfer equipment, and dump trucks. These impacts would result in an increase of 10 tons of NOx emissions relative to the proposed action. For all these reasons, we conclude that removal of the drilling fluid would not be environmentally preferable to the proposed action.

As part of our analysis, we considered alternative capture strategies for the drilling fluid including intermittent (as opposed to continuous) capture and use of a subsea casing. We determined that intermittent capture is not a feasible option because it would require multiple shutdowns of the drilling equipment as fluid is removed from the pit. This would increase the risk of borehole collapse and failure of the drill. Use of a drill casing at the exit pit potentially could be used to capture, collect, and re-circulate drilling fluid, but this method would result in additional impacts to the marine environment (e.g., additional pile driving to install and remove the casing) as well as increase the duration of offshore construction and risk of a rupture of the casing in the event of a storm. A rupture of the casing would cause an uncontained release of drilling fluid into the marine environment. For these reasons, we do not consider intermittent capture of drilling fluid or use of a subsea casing to be feasible alternatives.